NATURE MAGAZINE

MAY 1924

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Nature Calendar

May

In the deep of the wood and in shady dells violets, dewy and fragrant, are blooming.

Apple orchards are a sea of bloom.

Dogwood is clad in robes of white blossoms.

Again we may enjoy the delicately sweet fragrance of Lilacs after a Spring rain.

Jack-in-the-pulpit is preaching his sermons to all who would heed him.

Lawns and waysides are starred with golden Dandelions.

The one time bare and silent woods are now astir with joyful music and fluttering wings. Each day is marked with the glad return of some old feathered friend come home again.

Bird arrivals this month are mainly insectivorous.

When opening blossoms are exposed to the ravages of insect pests, Vireos, Warblers, and other insect-eating birds appear to protect them.

Resembling the song of the Junco is the bright cheery trill of the Myrtle Warbler during his Spring migration.

Light-houses and electric-light towers claim many of these night travelers as victims.

The song of the Hermit Thrush, exquisite in modulation and sweetness of tone, echoes through the mossy forest.

The Crested Flycatcher, inconspicuously attired, is hunting a snake skin for his nest.

While Mrs. Towhee patiently sits on the eggs in the nest, Mr. Towhee bustles energetically about in the thicket creating quite a stir and racket for one so small.

Mud daubers are stuccoing their summer homes.

Baby spiders are pitiless cannibals. From the five hundred or more young which hatch during the winter, only a few strong, well-fed individuals are now emerging from the nest, having fared upon their weaker sisters and brothers.

Dragon flies soar above the margin of the swamp, where mosquitos are most numerous.

The Queen of the Bumble Bees is raising her first brood.

Cut-worms have begun their rascally harvesting in the newly greening grain fields.

Monarch butterflies drift quietly over the low meadows, their bright orange-brown and black colorings making a conspicuous spot on the landscape.

The Cecropia moth comes into the world a sorry looking object, its wings wet and crumpled and its body furry and dishevelled. In a few minutes, however, a wonderful transformation takes place. The wings soon spread and dry, the antennae stretch out, the body becomes fluffy, and a beautiful creature stands poised ready for flight.

Mackerel are spawning along the Atlantic coast.

Red Squirrels are busy raising their families of hungry children.

Fluffy little Screech Owls begin to show pugnacious tendencies when disturbed.

The female Toad is laying her eggs in ponds and still pools along the streams.

Baby Skunks tumble and play together, suggesting the antics of kittens.

Prepared for NATURE MAGAZINE by the Cleveland Museum of Natural History

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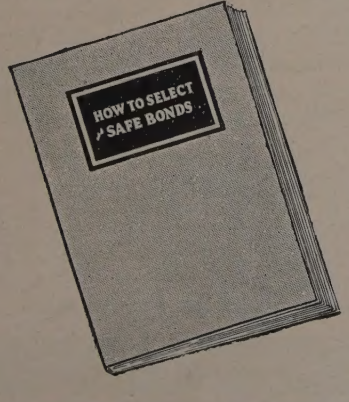

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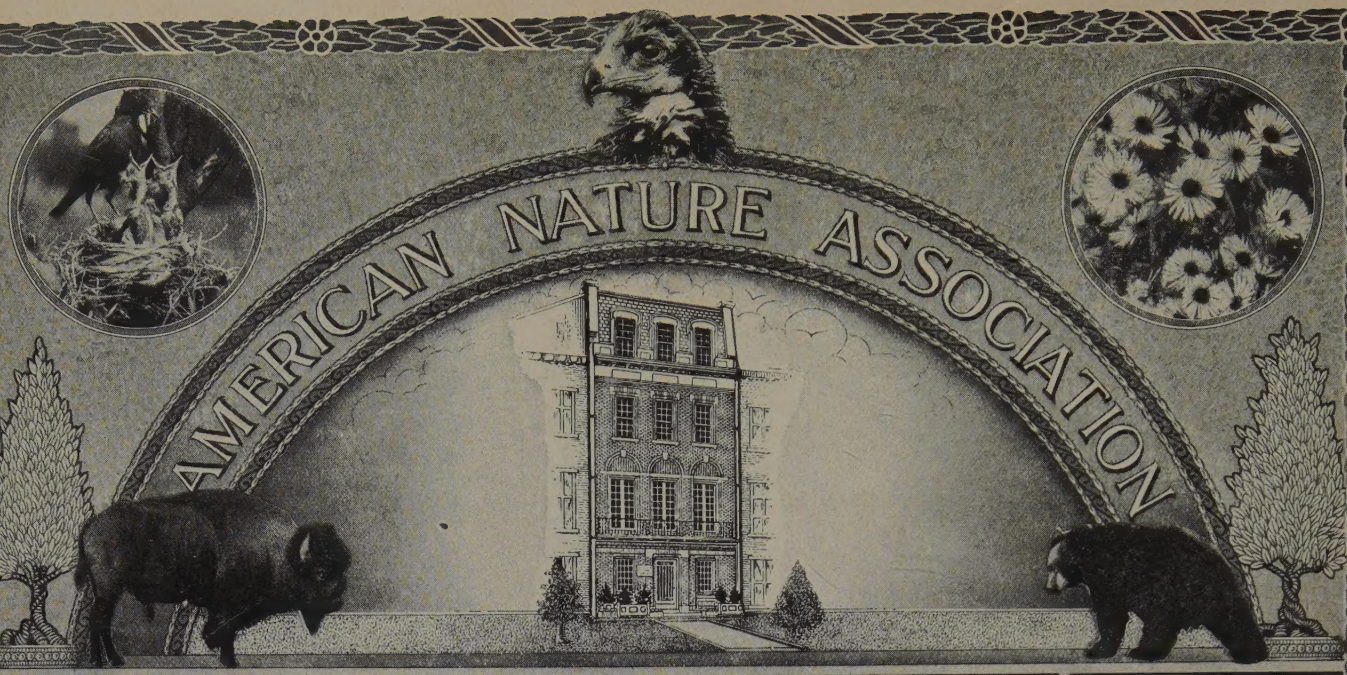

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Nature Magazine

An Illustrated Monthly With Popular Articles About Nature

Percival Sheldon Ridsdale, *Managing Editor*

Arthur Newton Pack, *Associate Editor*

25 Cents A Copy

MAY, 1924

Vol. 3 No. 5

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Photograph by William L. and Irene Finley

A young bluebird is one of the most satisfactory friends a child can have. He is easy to tame about the time he is ready to leave home. When he is experienced in flying about the world, he is more cautious.

NATURE MAGAZINE

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One who claims that he knows about it
Tells me the earth is a vale of sin;
But I see the bees and the birds—and doubt it,
And think it a world worth living in.
—ELLA WHEELER WILCOX.

The Joy of Renting Houses for Songs

By WILLIAM L. and IRENE FINLEY

Of the National Association of Audubon Societies

(Photographs by the authors)

BIRDS are just like people when it comes to renting houses. There is no accounting for tastes. Our children have put up fifteen bird houses for rent on our ten acres. One of the houses they thought was most artistic in a shady maple on the hillside was vacant all last summer. Two plain looking houses on telephone posts and one on the garage are always rented even though they seem unattractive. Several houses in our old apple trees are always in demand. Last summer, the children found that a pair of bluebirds was the hardest married couple in the orchard to please. They were so whimsical about houses. This pair examined five different flats. The children were satisfied they had rented one in an apple tree along the driveway. The prospective tenants went in and out, looked it over a dozen times from top to bottom. It was satisfactory. The landlords were glad to have this house taken by these gentle bluebirds, but there was no payment down.

Two days later, this couple changed their minds. They were fussing over a little house in the Baldwin tree opposite the front door. This was more attractive than the other house. Their minds were made up because they carried in some straws and discussed other furnishings.

The old story of catching a bird by putting a little salt on his tail merely means that a child can catch him by kindness or by giving him a bite to eat when he is hungry.

The first of the following week, the children came in and said the bluebirds were upset again. No one seemed to know the cause. We thought that with several other houses available, the bluebirds were perhaps whimsical about houses as people are. No house meets every requirement. Then we had a week of warm weather. Other birds were arriving. The bluebirds finally selected a plain weather-worn square house nailed to the cedar siding just outside an upstairs window. Perhaps the tenants thought they would be better protected here than in the apple tree. It was more pleasing to the children because it could be opened easily and they could see the inside of the bluebird home.

As time passed, the

bluebird tenants became very much attached to this house. The family of six young bluebirds was a great attraction because they could be watched from the window only two feet away. After they were grown, it seemed as if the youngsters would never leave home. Young bluebirds are naturally timid. They couldn't be thrown out bodily from the protection of the parental roof, but the mother and father had a way of their own to get them out. They finally refused to give them dinner until they flew out on the roof. All eight birds were together for days around the orchard. The young birds soon learned to hunt, but the parents were always indulgent and gave them morsels.

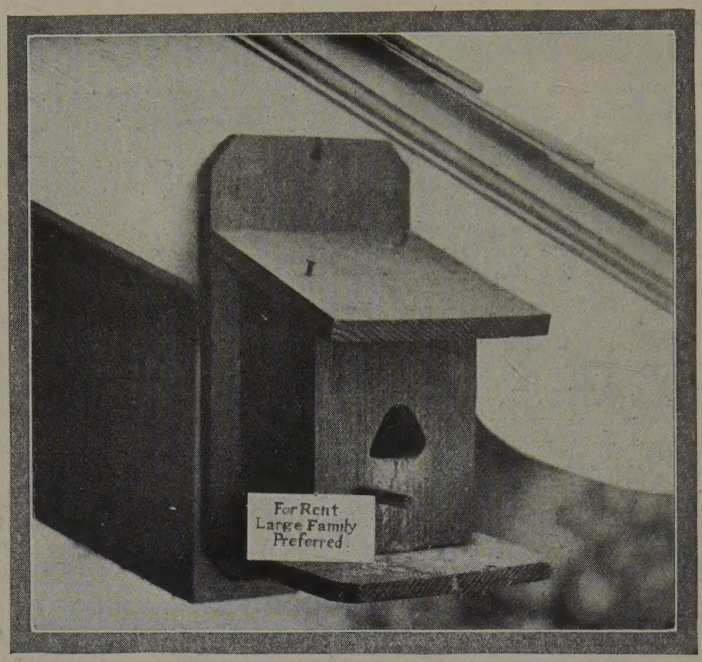


Photo by W. L. and Irene Finley

This type of bird house nailed to a quiet corner of the porch will not long be without an occupant.

A little later in the summer, the children saw mother bluebird carrying in straws to remodel her old nest. The real part of the story came when the mother and father bluebird were feeding their second family of fledglings. The older children were still following them about. We saw one of these grown youngsters carry in food and feed the little brothers and sisters of the second brood. Perhaps it was a girl bluebird who took so readily to caring for little ones. She had learned by watching her mother. It was something so human that our children will never forget it.

The past winter has been mild with but one spell of freezing weather and snow. During this time, a flock of bluebirds came every evening to sleep in the little weathered house. Late one afternoon, we counted ten bluebirds that crowded into this home for the night.

The bluebirds are always with us, but the white-breasted or violet-green swallows are only summer boarders. Their return, as a rule the first part of March, is an event the children watch for. How they skim across the fields and circle above the orchard! No doubt, some of the same birds return each year; they seem so well acquainted with our ten acres and with the different houses in the trees.

What a difference there is in bird tenants. Feathers are such an important part of the home life of these little swallows. They simply cannot get along without featherbeds for their birdlings. Our home on the river is such a favorable place that the children never have less than four or five pairs of swallows, and sometimes six or seven rent their different houses. When the swallows have laid their

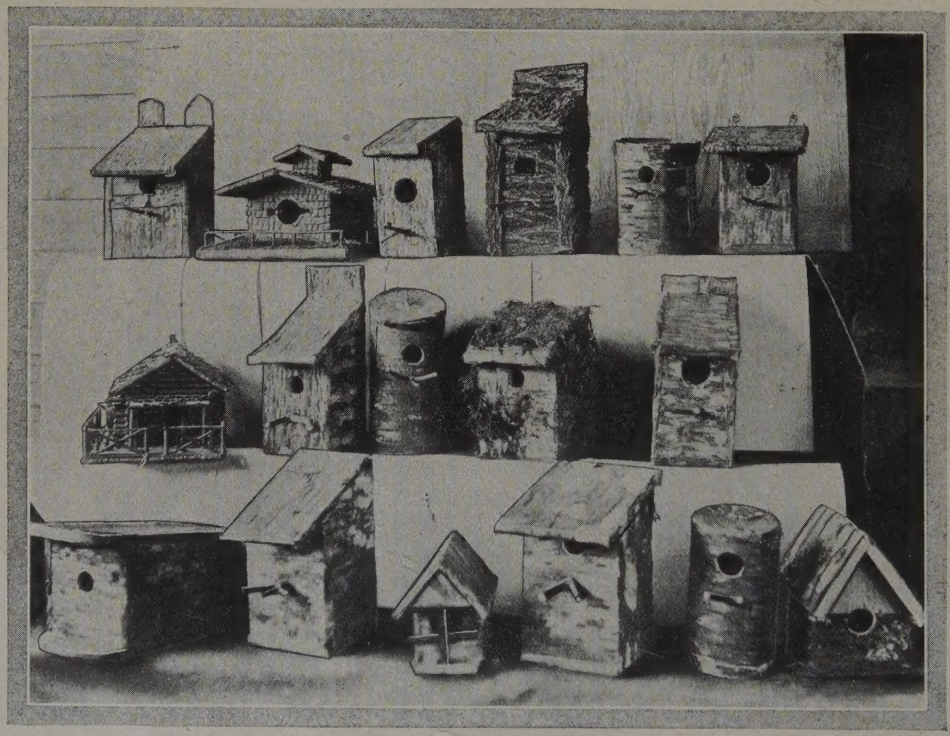


Photo by H. L. Bohlman

A group of bird houses made by the members of a Junior Audubon Society. A bluebird, swallow, wren or chickadee likes a small front door and a jump down to the living room. This is a protection to the young birds that are not so likely to fall out of the nest before they are able to fly.

foundation of grasses in a bird house, then they are always on the lookout for feathers.

It is a part of the pastime of the children to save a good bag of chicken feathers during the winter so as to be ready for this spring feather gathering of the swallows. The swallows soon learn where feathers come from. On warm spring mornings, they sit on the ridge of the roof over the front porch and twitter until the children get up and blow feathers out of the window. The minute a feather flies, it is the signal for excited twittering and the swallows circle about, snapping up feathers on the wing. Not one pair of swallows, but all the families in the orchard and the neighboring places, come wheeling in. What exciting aerial races! If it's a big fluffy feather, around and around it goes, higher and higher, twisting, dodging, turning up and down. It may change bills three or four times before it disappears in a round doorway.

Any child can be a landlord if he makes a bird house and puts it up in the back yard. He gets rent in songs and in the destruction of harmful insects in the garden.

The children find that swallows are so anxious to get feathers that when they stand perfectly still, there are usually one or two birds that are bold enough to take them from their fingers. It's always a novelty to help one of these little swallows furnish its home in such an intimate way.

Bluebirds and swallows are such delightful tenants, but the house wrens pay more rent in the way of songs. They bubble over with melody just as talkative people have to talk. They are fidgety because they live at high tension.

A pair of house wrens rented a home in one of our apple trees. The door and the inside of the house were too small for a bluebird, but the wrens could squeeze in very comfortably. While the house was small inside, it would have been just right if the wrens could only have done away with their long-established custom of making a nest of sticks. One flew up to the little doorway with a long stick. He couldn't get in with it, but he kept trying and trying, and his mate kept scolding until his patience seemed exhausted. The timbers were too long. Some stuck out of the doorway, almost blocking it. There were discarded timbers on the ground below the nest that couldn't be used at all.

After the house was full of sticks, they built a neat little nest at the bottom. The sticks were of no use, except that it wouldn't have been a wren nest without them. When the six eggs were hatched and later as the little birds grew, the house proved to be a little too snug, for a parent could hardly get in and turn around with the house so full of children.

A pair of wrens, like the bluebirds, will have two or sometimes three families of children during the summer. Before it came time for the

A full grown young house wren getting his first look out into the world. He lived in the heart of an old apple tree.

Making friends with young white-breasted swallow. This is a good bird to have about the garden or orchard, because he eats house flies and mosquitoes.

second family, something happened. The husband saw another wren lady that was more attractive. Perhaps his wife fussed too much. At any rate, there was a divorce and each set up housekeeping in another part of the orchard with a new mate.

Many people think that the birds are more stable in marriage relations than humans. This is not true as far as the little house wrens are

Our children have put up fifteen bird houses for rent on our ten acres—and all of them have tenants paying rent with song.

concerned. The history of half a dozen pairs of wrens in an orchard is interesting to record. The wrens fall into a whirlwind of love making early in the season. Instead of real marriages, there are some infatuations that do not last. Anyone with his eyes open can see an occasional flirtation. However, the partners generally stay together until the young birds are out of the nest. Then the wren divorce court is a busy place. The divorcees sing their troubles from the tree-tops. A male wren that bubbles over about his freedom soon runs away with a neighbor's wife. A

A western house wren with food for her young. A wren is a fidgety little tenant. He bubbles over and fills the orchard with song.

Photo by H. L. Bohlman

The best style of a bird house is modeled after a woodpecker's home. As a rule, he chisels out a round hole and drills down into the heart of an old stump. It is worth any boy's time to build a few bird houses and rent them for songs.

little brown female that tips her tail with a jaunty air and courts sympathy is sure to get it. Yet it is not all scandal among the wrens in the orchard. Sometimes a pair of little house wrens stays mated not only for the whole summer, but they go south together and return to the same home the following season. This has been proved by Mr. S. Prentiss Baldwin who banded and recorded the different wrens that lived in the houses on his farm near Cleveland, Ohio. We are not encouraging scandal on our ten acres, but nearly forty little wrens were raised last summer. Our old apple trees did not have a big crop of apples, but turned out a favorable crop of wrens, bluebirds, swallows and others.

A pair of violet-green or white-breasted swallows. These prefer a modern house and a bed lined with feathers instead of mud nests like the eave or cliff swallows.

The Evening Skies in May

By ISABEL M. LEWIS

URSA Major, the Greater Bear, whose brightest stars form the familiar Big Dipper, is at its highest position in the heavens this month. Look for it on the meridian due north at the time for which the chart is given.

If you have good eyesight, you will see a small star of the fourth magnitude close to Mizar, the star at the bend in the handle of the dipper. This is Alcor. The two stars are often called "the horse and his rider." The word Alcor comes from an Arabic word meaning "the test" and the Arabs made the separation of these two stars a test of eyesight.

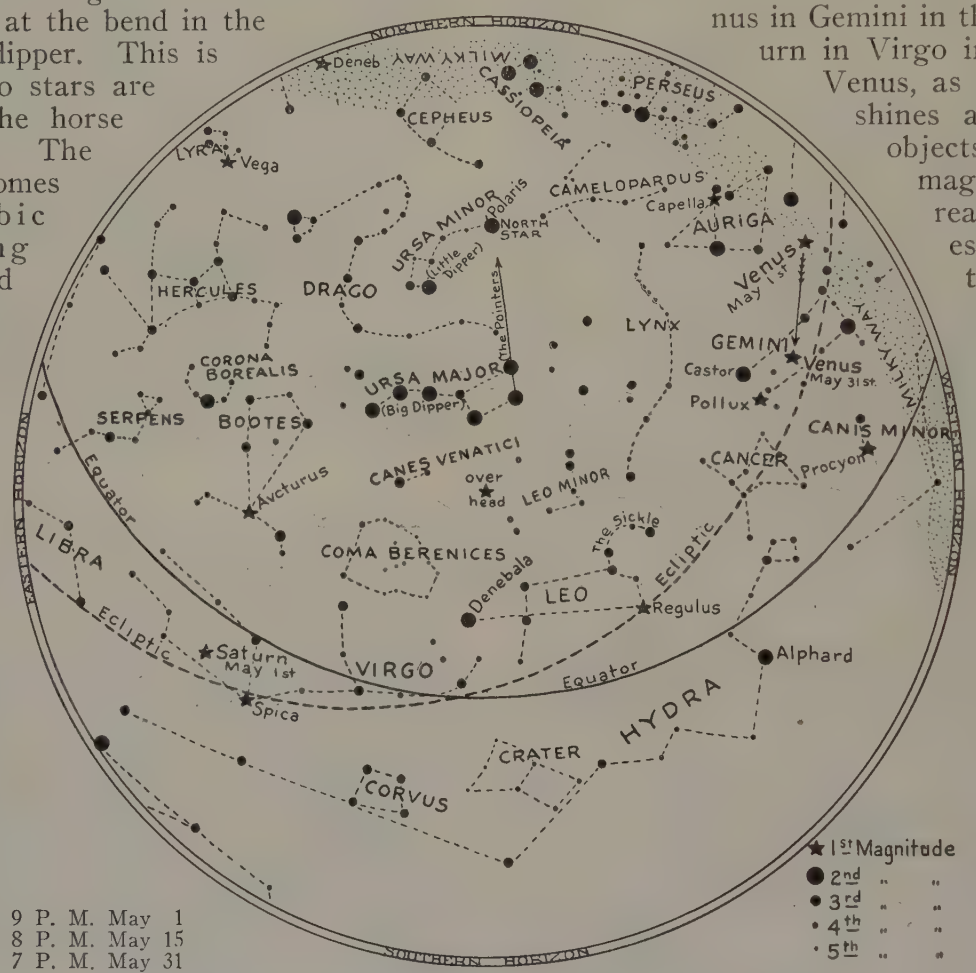
Everyone should know how to find Polaris, the pole-star and the direction of true north with the aid of "The Pointers" of the Big Dipper as indicated on the chart. The stars to the west and southwest of the dipper are also stars in Ursa Major, which is a constellation of great size, the dipper representing only the back of the bear and his ridiculously long tail.

Look also for Leo this month which you can distinguish by its peculiar sickle-shaped group of stars with the white first-magnitude star Regulus at the end of the handle. Regulus is at a distance of 300 trillion miles from the earth. Its light takes about fifty years to travel to us at the rate of 186,000 miles a second.

Denebola, the star at the tip of the lion's tail in Leo, the white star Spica in Virgo, and the orange-hued Arcturus in Boötes form a huge equilateral triangle. Denebola is almost due south now. Spica is in the southeast and Arcturus well up in the eastern sky.

Two planets will be visible this month at the time for which the chart is given, Venus in Gemini in the west and Saturn in Virgo in the southeast. Venus, as always, far outshines all other stellar objects. It is now a magnificent object reaching its greatest brilliancy on the twenty-fourth of this month. Jupiter, usually the nearest rival of Venus in brightness, is now in Ophiuchus and will rise in the east very shortly. Mars, which will become even brighter than Jupiter this summer, is now in Capricornus and will not rise for several hours.

An unusual astronomical event will take place on the seventh of this month when the planet Mercury will pass directly across the face of the sun. The last time this happened was in 1914 and it will not happen again until 1927. The "transit," as it is called, cannot be seen without a telescope for the planet in spite of its diameter of 3,000 miles will be a mere speck on the face of the sun. It will take Mercury eight hours to pass across the face of the sun and in the United States the sun will set before the transit is over.



9 P. M. May 1
8 P. M. May 15
7 P. M. May 31

HOLD OVER THE HEAD WITH TOP TOWARD NORTH

The Breaking of a Buffalo Team

By ERNEST HAROLD BAYNES

Contributing Editor NATURE MAGAZINE. Author of "Wild Bird Guests," "Polaris," "Jimmie," etc.

(*Copyright by Ernest Harold Baynes*)

TWO SULLIVAN County, New Hampshire, farmers met on the steps of the country store and the following conversation ensued:

"Hevya seen them buffaloes thet Baynes drives?"

"Wall, yes; but thet aint jest the way to put it. Baynes hitches 'em up and then they take him where they d—m please."

And although the statement was not strictly true, there was enough truth in it to make the driving of my buffalo team a sporting event every time I took it out. In fact, just to break a team of buffaloes is a sporting proposition. Anyone who doubts this need only try it to be thoroughly convinced.

The experiment began on a day which I have already described in NATURE—that April day on which a certain magazine editor, Bill Morrison, the Scotch gamekeeper and I visited the buffalo yards in the Blue Mountain Forest and photographed under difficulties the tawny calves and their murderously solicitious mothers.

When, after being chased from fence to tree, and from tree to fence again, we finally had all the photographs we needed, the question arose as to how we could best separate from their mothers the particular calves we had selected for the experiment. Morrison answered this question promptly. The several buffalo corrals adjoined one another, and the quick-witted, nervy Scotchman, by nicely timed driving and the rapid opening and shutting of gates, soon had our four calves in one yard and their waspish dams in the next. This separation did not lessen the excitement. The nimble youngsters raced back and forth along the dividing board fence, and their furious mothers raced with them, sometimes plunging into the fence in their efforts to rejoin their offspring. We were now in the corral with the calves, and in all sincerity we prayed that the fence would hold.

HOW THE BABIES WERE FED

Buffalo calf drinking from a nursing bottle and being firmly held by the author.

The next step was to capture the calves and put them into crates. I had a splendid plan for doing this. It consisted of driving the calves, one at a time, down a "shute" and into a crate placed at the narrow end. And it worked beautifully—in theory. In practice, the calves would shoot anywhere except into the "shute." We decided to catch them by hand. There were five of us now and we had a merry time. A calf would come tearing across the corral, and when a man tried to stop it it was likely to hit him somewhere below the waistline and knock him into the mud. Everyone of us went down at least once before we caught a calf. At last a man succeeded in stopping one of these living projectiles and, with two other men who ran to his assistance, managed to put his prize into a crate. When another calf was captured and put into the same crate, the two faced one another and fought like Kilkenny cats.

Eventually all four calves were crated, and Morrison with his bay mare, Maggie, started across Croyden Pass, on a twelve-mile journey to my home. With another horse, I drove around the north end of the mountain with two cows which were to supply the milk for the orphaned buffaloes.

I arrived first and put the finishing touches to a large wooden pen which I had built on the floor of the barn. About nine o'clock that night Morrison pulled in with his hairy freight. One at a

time we placed the doors of the crates at the door of the pen, and the least touch with a stick was enough to send the calves flying on to the floor of the barn. We were using a lantern and this threw the moving shadows of the buffaloes on the opposite wall of the pen. What those shadows were, the calves had no idea, but they were not taking any chances. With reckless abandon they charged upon these probable enemies and butted them until it seemed the shadows must be welded on the boards they fell across.

Naturally I wanted to make friends with my little charges as soon as possible, so I went into the pen with them. But they were so utterly crazy, racing across the floor and leaping at the walls, that I went out again. I didn't want them to hurt themselves—and there were other reasons. Then I remembered that if captive deer are placed in a dark room they will not struggle, but allow themselves to be handled without resistance. I thought that perhaps the same conditions might have the same effect on buffaloes. I ordered the light removed, went back into the pen and began to grope around, trying to find a buffalo calf. Before I could do it, one of them found me. Just where he hit me I can't remember, and it doesn't really matter, but in a few moments it seemed as if the entire quartet had got my range and were bombarding me from all points of the compass at once. I started to retreat in fairly good order, but one particularly vicious plunge laid me low on the floor of the barn and the retreat became a rout. I scrambled out of the pen and bid the calves "good-night."

BECOMING DOMESTICATED

War Whoop, the young buffalo, growing bigger and stronger, drinks from a calf-feeder.

Next morning, Morrison was so sure that I was going to kill all four of the little buffaloes, and begged so hard to be allowed to save two by taking them back to their mothers, that I gave him permission to do so. When he had gone, I called the editor and told him that the time had come to give the two remaining babies their first meal. We went to the barn together, each carrying a quart bottle of milk, with a rubber nipple attached to it. I opened the pen and held out my bottle to the nearer calf. His reaction was to wheel and, like a four-footed flash of lightning, to kick that bottle into about ten thousand pieces. Evidently our work was cut out for us. We built a stall on one side of the pen, and as the wild-eyed little demons swept around the enclosure I stepped out and seized one, and, before he knew it, backed him into the stall. One arm was over his shoulder, the other under his throat. He could not move backward or to either side. All he could do was to plunge forward, kicking and butting and bellowing at the top of his lungs. I turned to the editor and said quite cheerfully:

"Will you kindly take that extra bottle of milk and put the nipple into this calf's mouth?"

The editor had been watching the calf and did not like the looks of it, and in truth the air in the vicinity of that stall *was* rather full of horns and hoofs. He stood in the middle of the floor and scratched his head.

A POWERFUL LITTLE TEAM

Six months old buffalo calves pulling a drag after being patiently taught to submit to harnessing.

"Look here, Baynes," he said, "anyone who wants that job may have it; I don't want it."

Now there are times when, if a man has any profanity hidden in his system, it leaps forth from its hiding place with startling suddenness. One of those times had come for me, and the editor decided that he'd take the job after all. He thrust the nipple into the open mouth of the bellowing calf, and the latter, after sputtering, butting and kicking for a space that seemed longer than it really was, finally seized the nipple and sucked as if he wanted to swallow the bottle.

We had a similar fight with the other calf, and took comfort in the thought that we could at least prevent them from starving themselves to death. That evening at seven o'clock the circus was repeated, but at ten o'clock, when we went out to administer the final meal of the day, one of the calves took a few steps toward me, and when I held out the bottle of milk he took the nipple and sucked like Mary's little lamb. From that time we had no trouble in getting the calves to feed.

BUFFALO TEAM ON THE ROAD

Driven over a New Hampshire turnpike they aroused the comments of the farmers.

READY FOR THE FAIR

The six-months-old buffalo team working in double harness.

WAR WHOOP IN SINGLE HARNESS

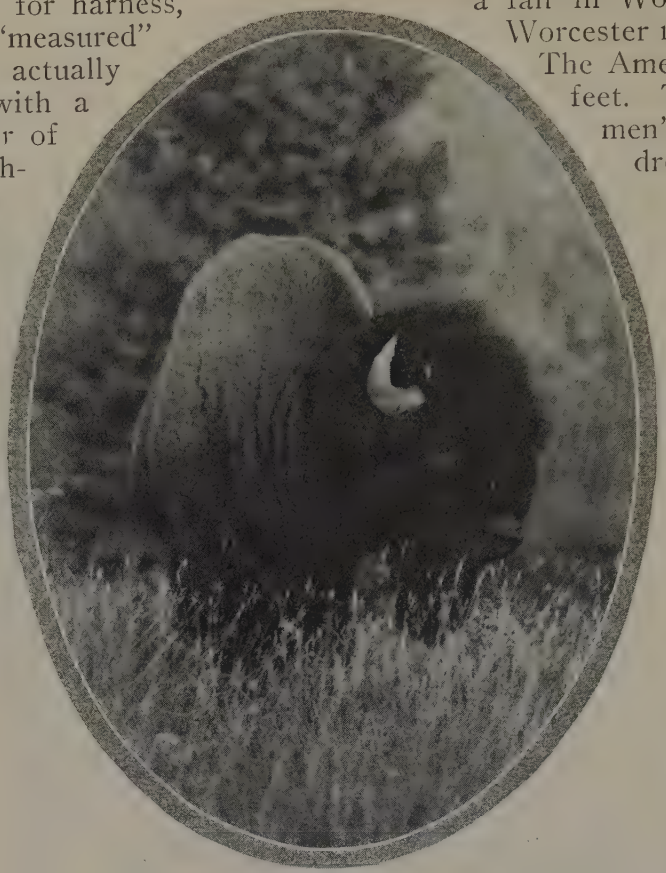
He was not always as well behaved as he appears to be in the photograph.

When they had become thoroughly familiar with the drinking bottle, they were introduced to a calf-feeder, from which they drank as contentedly as domestic calves. One day while one of them was so occupied I slipped a halter over his head before he knew it. He capered all over the field like a dog with his first tin can, but presently calmed down, and I snapped a lead-rope onto the halter ring, and tried to lead him. I had tied knots in the rope to give me a better hold. As I started to pull, the buffalo planted his feet firmly in the mud. I pulled and pulled until at last, finding that his neck would not stretch any further, the calf gave a tremendous leap forward and planted his feet as before. But gradually he learned what was required of him and trotted along with me very nicely. I soon found that the calves disliked to be separated, and that they traveled much more willingly if they were taken out together. After that they usually were treated as a team. We named them "War Whoop" and "Tomahawk."

When the babies were ten weeks old I put a little calf-yoke on them. Perhaps thy did not actually turn somersaults, but they seemed to, and the remains of the yoke lay on the ground, beyond repair. Another and stouter yoke was used, and this resisted their most furious efforts to get rid of it. In a few days they did not mind it at all and were actually drawing light loads, like little logs of wood, attached to a rope which was made fast to the yoke ring.

At the age of five months the youngsters were very strong, and when hitched to a stone-boat or "drag" intended for adult oxen, they could haul it all over the country with me standing on it to

drive them. But long before they were as old as that I had them measured for harness, single and double. I say "measured" because a harness-maker actually did arrive one morning with a tape-measure. As a matter of fact he never used it. I tethered the calves for him, but after watching their antics for a few moments, he decided that he could "estimate" their measurements, and this he did. The harness had to be returned more than once for alterations, but at last it fitted them and they were ready for the work they were to do. For it should be noted that they were not being broken as a "stunt," but for the purpose of creating additional interest in The American Bison Society, organized to prevent the buffalo from becoming extinct.



GERONIMO

The father of Tomahawk and a magnificent specimen of a buffalo bull.

And they played a gallant part. Again and again they appeared at great agricultural fairs and sportsmen's shows, to show their speed and strength and indomitable spirit; to remind Americans that the remnant of a once great race was worthy of salvation. They literally reared and plunged and kicked and galloped their way into the hearts of thousands of red-blooded people willing and able to take a hand in preserving their fellows. They tore around the track at a fair in Worcester, and the people of Worcester raised the money which put The American Bison Society on its feet. They appeared at a sportsmen's show in Boston and hundreds of those who saw them became members of the society. Wherever they went they compelled interest and ensured success.

Sometimes they went out of their way to do a good turn for others. After the fair at Worcester, for instance, they almost galloped their legs off to raise money for a babies' hospital, and when they were two years old went to Dartmouth College and took a very strenuous part at an amateur circus given in connection with the Junior Prom.

Their last public appearance was at a great agricultural fair at Waterville, Maine. They were then two-and-a-half years old and veterans in harness. There were two hundred and fifty teams of steers on the fair grounds, and I issued a challenge to all for a contest of speed on the track. At first no one accepted it, but presently a young farmer, a very good sport, came to talk it over. He said that he had no team that he could race against me but that he had a single steer that was

TOMAHAWK AT HOME

Now well grown but still gentle enough to go to the house and get a drink from his old nursing bottle.

(Continued on page 314)

WHERE NATURE STORED RICH TONS OF LIGNITE

A coal mine on the plains of North Dakota rated as one of the largest lignite producers in the world with a daily output of 5000 tons.

Lignite—A Future Fuel

By STANLEY WASHBURN

HAVE you ever climbed a monument? If you have you know that about half the way up there is usually a resting place. There you are inclined to stop and look out through a little window in the granite to see how far you have climbed and to wonder how far there is still to go.

Lignite, or brown coal, is that halfway point in the monument of carbon. Down at the start is the decaying leaf or fern or tree trunk. On the way up you encounter hardening plant life, then peat and then lignite. If you continue on upward, you find soft coal, hard coal, graphite and, at the top of the monument, diamond.

Now this monument is dedicated to carbon for a very good reason. It was the carbon in the rich ferns and mosses and plant life of millions of years ago that laid the basis of coal. It is the amount of carbon in peat, lignite and coal that measures their heating value to us. It makes graphite, toward the top of the monument, for its peculiar uses. It creates, in its highest form, the beautiful diamonds.

Go back in your mind a mere matter of many million years. Picture great waving tree ferns; giant club mosses towering in the air instead of hugging the ground; big marsh horsetails; hollow-stemmed trees growing to a height of seventy feet. Try to breath air more heavily laden with carbonic acid gas than is now necessary for plant life. It is moist and warm all about you. The earth is still cooling. Once in a while it is convulsed by the heat, and away goes your forest. It is buried and another grows.

Lignite is a long way advanced from the starting point toward coal. Gradually the gases in the original substance have become less and less. With their release, carbon has taken their place. Where about one-half of wood is carbon, lignite contains about 67 per cent. Some of it retains much gas.

The United States has coal resources estimated at three and one-half thousand billion tons. Nearly one-third of that is lignite. Of this one-third, about 950,000,000,000 tons are found within the borders and beneath the surface of the states of Montana, North Dakota and South Dakota. Texas has a resource of approximately twenty-three billion tons, and Alaska boasts seven and one-half billion. In some other of the western and southern states deposits are found.

While there are many degrees of lignite in Texas, much of it is of the spongy variety which earns the name of brown coal for this product of the soil. The Alaskan resource is generally of slightly better variety, while the scattered deposits vary widely in quality. The bulk of the lignites found in the three northwestern states, however, are well-formed coals. The vegetable stage has been passed in the transition toward coal. They have a clean, black appearance, with a moderate luster. While there is more moisture in them than bituminous or soft coal, this is really their only difference from this fuel.

These are great resources. They are important ones. The economic problem involving their utilization is not a local one. It is a national question of more far-reaching significance than is generally realized. As we have been prodigal of our forests, so have we been wasteful of our immense wealth in coal and oil and other mineral resources. At

STRIPPING COAL FROM THE SURFACE IN NORTH DAKOTA

Lignite occurs either above ground or in seams underneath, being mined either by giant shovels or like soft and hard coal as the case may be.

the same time as we have wasted we have woven them into our national life as essentials. In some directions we are facing shortages. Increasing demands made by our standards of living and complicated civilization bring the day of exhaustion nearer. Elimination of waste, intensive use of that which we have, and respect for the value of our natural resources are essential.

For many years coal has been hauled from the east to these western states which have this valuable resource beneath their soil. Twenty million tons are carried for an average of 1,000 miles at present high rates for freight. Minnesota and North and South Dakota pay an annual coal bill amounting to nearly $150,000,000. This tremendous sum represents more than will be realized this year from the wheat crops of Minnesota and the Dakotas. They must pay it to the railroads and mines of the east at a time when they must also borrow heavily from the east to finance the movement of crops. The states tributary to these states are in a similar position.

This is economic waste. It costs millions in unnecessary freight charges. It requires the travel of thousands of freight cars and engines. It diverts crew-power needed to serve sections closer to the mines, which now are forced to obtain their coal supply from hand to mouth.

It is only within the last few decades that the realization has dawned upon the northwest that in the lignite coal there exists an adequate alternative to the use of anthracite and bituminous both for power and domestic use.

AN UNDERGROUND SEAM OF LIGNITE

Repair shop in a mine beneath North Dakota prairies, showing the structure of the seams.

This dawning appreciation of the vast latent resources beneath the prairies of the northwest promises to be the beginning of an industrial revolution in that section of the country.

SUBTERRANEAN CORRIDOR LINED WITH COAL

One of the main lines of communication in a lignite mine that has 25 miles of underground galleries.

Obviously, the development of the lignite industry has been discouraged in every way, possibly by the well-organized interests that have been supplying the northwest with coal. Almost every dealer in the west represents some eastern mine, and unintermittent attacks on lignite as an alternative for eastern fuels, both anthracite and bituminous, have retarded the development which promises to be the Dakotas' greatest asset.

America is so vast that few realize the enormous empire which the three northwestern states represent in comparison to European countries. How many Americans, for instance, realize that Minnesota and the Dakotas have an area of 27,000 square miles more than the German Empire, and 20,000 square miles greater than the French Republic. These three states, isolated from the rest of the Union, would extend in area beyond almost any country in Europe with the exception of Russia, and they have the resources which can make them practically self-supporting and self-sustaining.

In order that Americans may realize the vast wealth on which the northwest is sleeping, it is interesting to call attention to the other nations whom we consider large in coal possessions. England, who is known throughout the world as one of the greatest coal producers, estimates her total supply of unmined coal at 209 billion tons. Germany's resources are supposed to be 467 billion tons; France, whom we look upon as a great coal-producing country, has 19 billion; therefore, the greatest coal producers of Europe combined have less coal

(Continued on page 310)

LIGNITE ON WAY TO SERVE MAN

Foot of shaft 60 feet below the surface of lignite mine, where Dakota's resource is stored.

By L. W. BROWNELL

(Photographs by the Author)

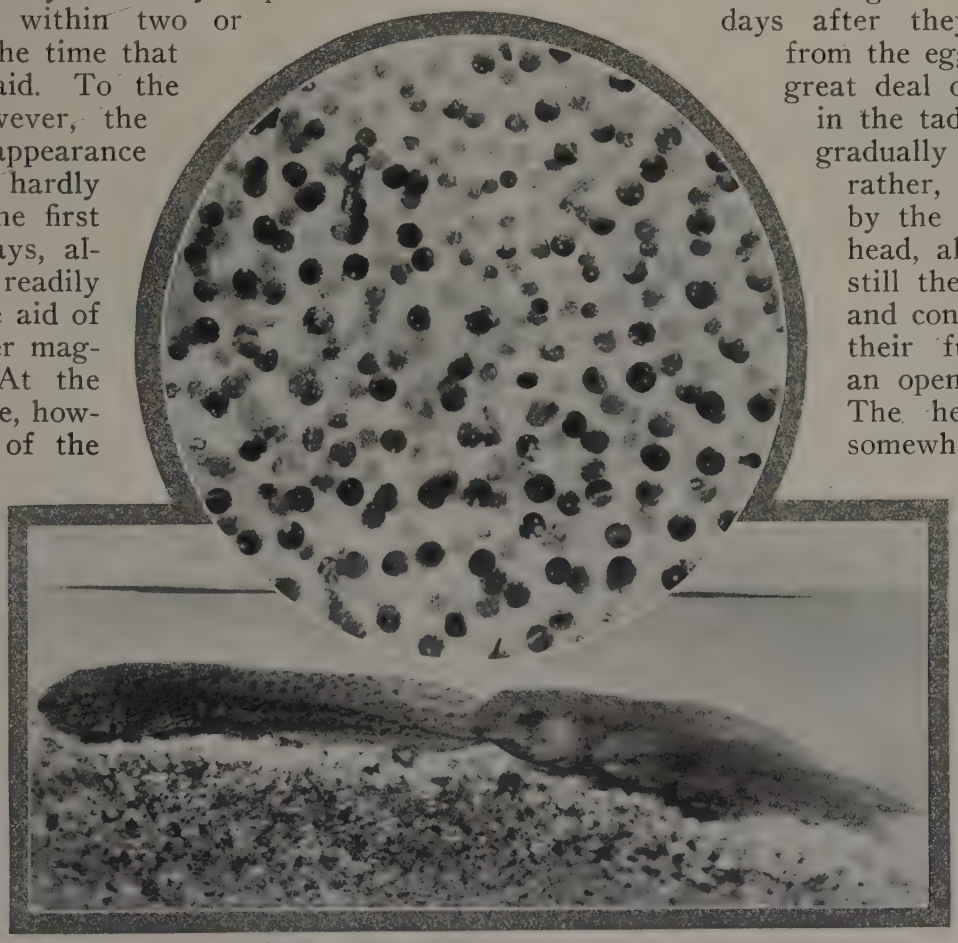
THOSE among us who are fortunate enough to live in the country are thoroughly familiar with the chorus of frog voices that arises from marshland or stagnant pool in late March or early April. The first of these to pipe up, frequently to be heard as early as the latter part of February singing from some pool that is still half frozen over, is the little Pickering's Hyla, or "Spring Peeper" as he is often called. Very soon, however, the Chorophilus and others join in, then come the deeper voices of the larger frogs, the Leopard, Pickerel and Green Frogs, and last, but very far from being least, the deep bass "jug-o-rum" of the Bullfrog adds the final voice to the wild choir.

But it is not alone to show what they can accomplish in the vocal line that the frogs and toads (officially known as the Salientia, or Tailless Batrachians) seek the water. In fact this is but the smallest part of their reason for doing so. All winter they have lain dormant, deeply buried in the mud or beneath some stump, log or stone, entirely obvious to all that was passing about them. If we had found one of them during this time, we would have found him stiff from the cold and to all appearances actually dead. Nature has awakened them at the proper time, however, for even though the weather may still be cold, they dig themselves out of their winter's bed as soon as the ground has thawed sufficiently to allow them to do so. How it is that they know when it is time for them to come forth is one of the mysteries of Nature that has never been satisfactorily solved. Nevertheless, they are never late. Immediately they have crawled from their muddy beds they seek the nearest stagnant water in which to deposit their eggs, for the early life of the frog is passed entirely in the water. These eggs are laid singly or in small clusters, as in the case of some of the tree frogs, or in large masses, as in the case of all the true aquatic frogs. They are usually attached to some water plant, dead stick or other similar anchor, but occasionally they are allowed to float free, held at the surface of the water by their own buoyancy.

The number of eggs laid varies considerably in different species, but, almost unbelievable as it may seem, the mass of eggs laid by one frog is much larger than the frog itself. Thus, in the case of the Leopard Frog, the frog itself, when fully grown, is between three and four inches in length, yet it habitually lays between five and six thousand eggs, which form a mass approximately five inches long, five inches wide, and two and one-half inches thick, or from four to six times the size of the frog that laid them. The eggs themselves are velvety, black and small, somewhat less than two millimetres in diameter, but each true egg is surrounded by a jelly-like substance which expands greatly as soon as it touches the water. Thus is explained the mystery of an animal being able to lay so many eggs that they form a mass much larger than the entire body of the animal itself.

This transparent, jelly-like mass serves two very important purposes. First, as a kind of incubator, for it absorbs and holds the heat of the sun's rays, thus surrounding the eggs with a higher tempera-

ture, and one much more equable, than that which the water could afford them. Second, as a protection to the eggs from being devoured by their natural enemies, for it converts the mass into a slippery, altogether difficult object for any animal to handle, and were it not for this there is no doubt but that a great many more of these eggs would be eaten every spring by the birds, turtles and other creatures than now are. The development of the embryo is very rapid and commences within two or three hours of the time that the eggs are laid. To the naked eye, however, the change in the appearance of the eggs is hardly noticeable for the first two or three days, although it can readily be seen with the aid of even a low-power magnifying glass. At the end of this time, however, the form of the egg has noticeably changed from round to oblong, and this elongating process continues until, by the fifth or sixth day, the embryo has taken on a somewhat curved shape and one can readily distinguish the form of the young tadpole and even definitely determine which is the head and which is the tail end. On the seventh day the tail appears distinctly finned, and we may see distinct evidence of life by an occasional jerking movement of the tadpole. During this time the jelly-like substance in which the eggs are held has been slowly softening and disintegrating until by the ninth or tenth day the tadpoles are able, with a good deal of wiggling and squirming, to work their way through to the outside and cling, by a small sucker-like apparatus on the underside of their head, to any vegetation or other support that is near at hand or to the outside of the jelly mass itself. At this stage of their existence the tadpoles of nearly all the frogs are dark colored. Some, as those of the Leopard Frog, are black, while others, as those of the Green and Pickerel Frogs, are grey or brown. On each side of their necks is a bunch of small, fringe-like projections that have been forming during the past few days. These are their gills that enable them to breathe, for during this part of their life they are entirely aquatic and rarely come to the surface of the water. During the first five or six days after they have escaped from the eggs there is not a great deal of change visible in the tadpoles. The gills gradually disappear, or, rather, are covered up by the enlarging of the head, although they are still there on the inside and continue to perform their function through an opening in the skin. The head has grown somewhat larger and the tail longer. They are very inactive, passing most of their time clinging to some convenient support with only an occasional short and, apparently, aimless trip that ends on some other support close by. At the end of this period, however, should we examine them closely we would find that the little tadpoles had acquired a mouth and their appetite has appeared coincident with the coming of a means whereby it might be appeased.

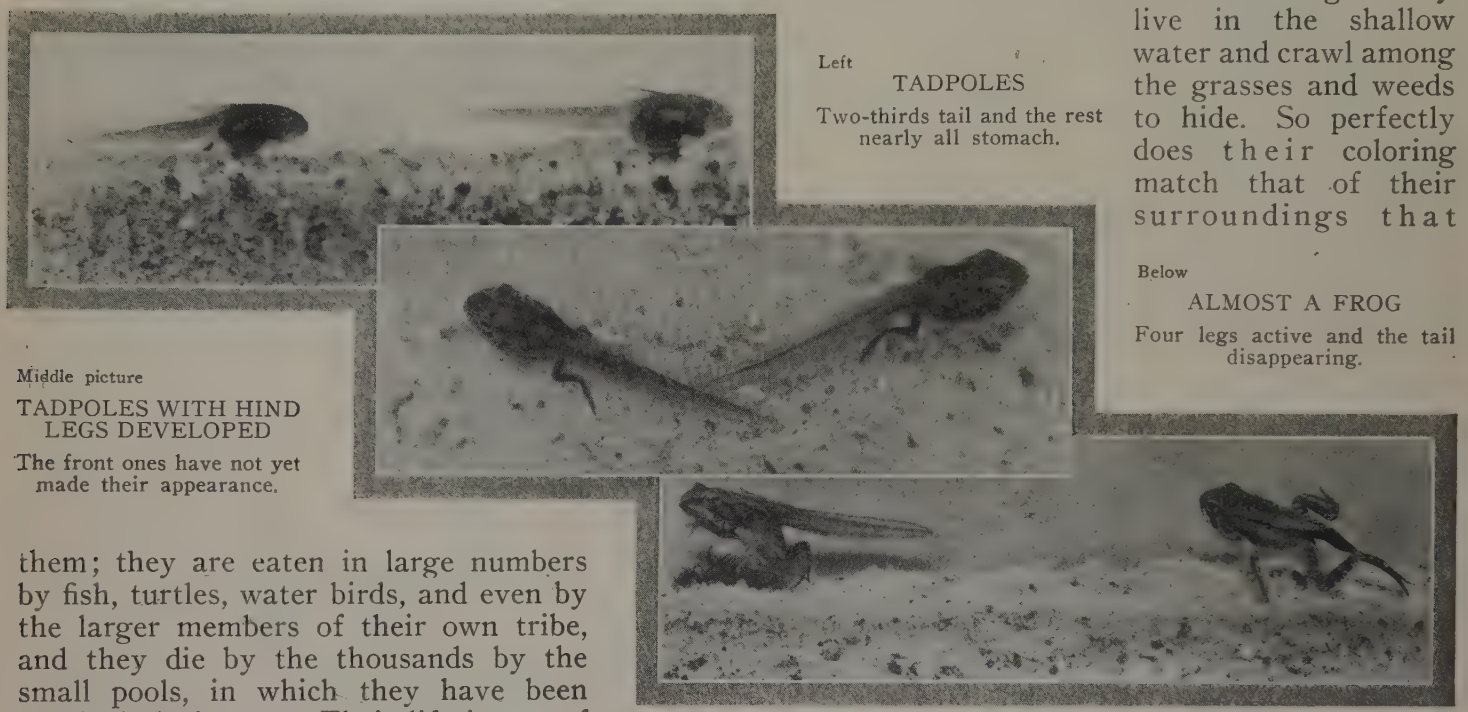


Above
FROG'S EGGS ABOUT NATURAL SIZE

Below
LEOPARD FROG TADPOLES JUST BEFORE THE APPEARANCE OF THE LEGS

They are now no longer quiet but swim rapidly about in the water, only pausing occasionally to nibble at the small, delicate water weeds or at the slime that covers the rocks and the bottom of the pool. Their color has changed from black to a golden brown due to a mottling of fine golden spots, and altogether our little tadpoles are far from being entirely unlovely creatures. They spend the greater part of their time in eating, when they are not swimming rapidly about, and

they grow very fast. They have many enemies that prey upon them constantly. The larvae of the dragon fly and several different species of water beetle are ever upon the alert for them; the larvae of the caddis-fly devour them whenever they get the chance; the leeches, which swarm in many stagnant pools, wage constant war upon them; they are eaten in large numbers by fish, turtles, water birds, and even by the larger members of their own tribe, and they die by the thousands by the small pools, in which they have been hatched, drying up. Their life is one of constant danger and hair-breadth escapes, and it is a source of wonder that any of them manage to live to a size when they can turn the tables against some of their enemies and become the aggressors, eating those that would have eaten them. In point of fact it is very probable that not one-tenth of them ever do reach maturity and this is well, for if all the countless millions of frog's eggs that are laid every spring should hatch and grow to be frogs, the earth would soon be overrun with them.



Left
TADPOLES
Two-thirds tail and the rest nearly all stomach.

Middle picture
TADPOLES WITH HIND LEGS DEVELOPED
The front ones have not yet made their appearance.

Below
ALMOST A FROG
Four legs active and the tail disappearing.

About ten days to two weeks after they have commenced to take real food their legs appear, the hind pair some days ahead of the front. In point of fact, however, both pairs begin to grow at the same time, but the front pair is hidden under the skin for several days before pushing their way through the apertures in the skin formerly occupied by the gills. At this time the tadpole is about an inch in length, two-thirds of which is tail with a wide, semi-transparent fin on both the upper and lower edges. The rest seems to be all stomach with a mouth and two eyes on one end. About this time a change comes in the breathing apparatus, and the need of more air drives him frequently to the surface of the water. By the time the legs are fully developed the tadpole has reached a size of from an inch and one-half to two inches. Now the tail commences to shorten and disappear, being absorbed into the body, until nothing but a short stump is left and the tadpole has become a frog.

During the summer months the ponds and ditches are alive with these small frogs. They live in the shallow water and crawl among the grasses and weeds to hide. So perfectly does their coloring match that of their surroundings that when one little fellow disappears we must have sharp eyes indeed in order to find him again. They wander through the long grass of the wet meadows for considerable distances in their search for food and are indefatigable insect hunters, greedily devouring small grasshoppers, crickets, beetles, etc., of which they destroy incredible numbers. In fact frogs, next to the birds, are probably our best allies in the constant war which we must wage against the insect hordes. Also they do absolutely no harm and so can be called, economically, of really great value.

Despite the fact that they seem to be always eating and are capable of assimilating large quantities of food their growth from now on is slow and it may be several years before they attain their full size.

In the foregoing description of the early life of a frog I have used the Leopard Frog as an example. The fact is, however, that, with but slight changes, it will answer for an accurate description of the early life of any of our frogs. The time occupied in the development of the embryo in the egg varies in different species and, even in the same species, is affected by changes of temperature. The length of the life of the tadpole varies

from only about two weeks, as in the case of some of the smaller frogs, to two or even three years, as with the Bullfrog. Also the size of the tadpole, when fully grown, ranges from less than an inch, as that of the little Cricket Frog, to the Bullfrog's great six or seven-inch long tadpole. In all the

YOUNG FROGS

Note that the tail is growing shorter and the legs more fully developed.

main points of their growth, however, there is but little difference, and he who has learned the life story of one of these creatures knows much of them all.

The Leopard Frog is not only the commonest frog in this country but it is also one of the hand-

LEOPARD FROG

This frog when full grown is between three and four inches in length.

somest. It is, undoubtedly, the best known as it is met with more often than any other, owing to its habit of traveling for considerable distances away from the pool or swampy piece of ground that is its home. It is between three and four inches long when matured and in color is either green, grey or brown above, and white or yellowish white, beneath. There are two irregular rows of brown spots on the back and two more on each side. These spots are surrounded by a ring of lighter color and this serves to distinguish them from the Pickerel Frog which is much the same in size and coloring, but whose spots do not have the lighter ring and whose underside is more of an orange color.

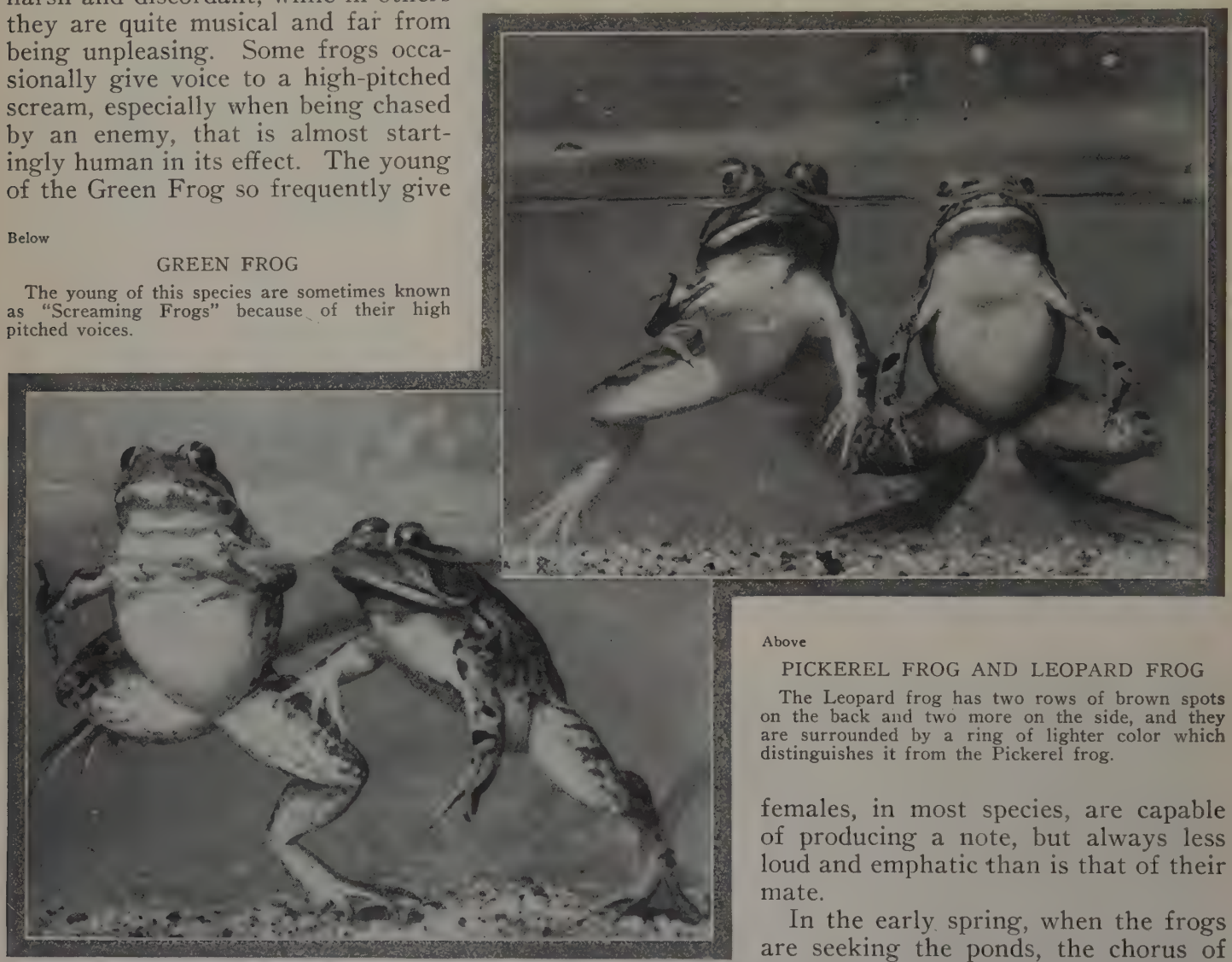
When we walk through the long grass of the low meadows and a frog jumps from beneath our feet it is almost certain to be a Leopard Frog. Should we attempt to catch it we are likely to have our labor for our pains, for it is extremely active and its ability in evading capture is almost marvelous. Even when we think we have him safely in our hands we are most apt to find that we are mistaken, for his body, slim and slippery,

ADULT GREEN FROG

The voice of this species is quite different from the voices of the Leopard and Pickerel frogs.

is possessed of wonderful strength, and before we can realize it, he has escaped. If, however, we manage to hold him in a grasp from which he is unable to wriggle free, we are likely to have one of the surprises of our lives, for he will presently stop all of his exertions to escape and commence to talk to us. He actually gives voice to what seems to be, and probably is, expostulations at such summary treatment, and his tones are far from being unmusical. It comes as so complete a surprise to one who has never before heard it that he is likely to involuntarily loosen his hold and give the captive his chance to escape. Possibly this is just what he expected might happen, at all events he is not slow in taking advantage of this momentary lapse of attention on the part of his captor and the next instant, with a flash of white legs, he is gone.

All of the members of the tailless batrachians can produce sound by means of vocal cords, and they can, therefore, be said to possess true voices. To anyone who is familiar with these frog voices it is easy to positively identify each species by means of his call alone, for each one is distinct and entirely typical. In some cases these calls are harsh and discordant, while in others they are quite musical and far from being unpleasing. Some frogs occasionally give voice to a high-pitched scream, especially when being chased by an enemy, that is almost startingly human in its effect. The young of the Green Frog so frequently give utterance to such a cry when disturbed that they have earned the name of "Screaming Frog" in some parts of the country.



Below

GREEN FROG

The young of this species are sometimes known as "Screaming Frogs" because of their high pitched voices.

Above

PICKEREL FROG AND LEOPARD FROG

The Leopard frog has two rows of brown spots on the back and two more on the side, and they are surrounded by a ring of lighter color which distinguishes it from the Pickerel frog.

As a rule, however, the typical call of the frogs consists of a single note repeated either rapidly (with some so rapidly as to be almost a trill of sound) or slowly, according to the species. This is uttered in a different key by the different species and even is subject to some change in this respect by different members of the same species. Each call, however, is entirely individual and peculiar to the species that gives voice to it, and once learned, they can never be confused. The males are the principal "singers," although the females, in most species, are capable of producing a note, but always less loud and emphatic than is that of their mate.

In the early spring, when the frogs are seeking the ponds, the chorus of voices is often discordant in the extreme but, occasionally, it is almost melodious. Whether or not it pleases our musical ear, we must all agree that it is a joyous sound, coming as it does when winter is hardly a thing of the past, and one which we would not care to lose. It is Nature's true harbinger of spring and we are all glad to hear it.

Nature and Human Nature

A Story of the Woodcraft Idea

By ERNEST THOMPSON SETON
Chief of the Woodcraft League

WOODCRAFT is a man-making scheme with a blue-sky background. *Woodcraft is recreation*, preferably out of doors. Unlike some other organizations, the Woodcraft League does not deal with vocation, but with avocation. Laundry work, plumbing, school teaching, banking, real estate or insurance are perfectly honorable callings, but woodcraft does not propose to give an honor to the laundress who has ironed 24 collars without singeing them, to the banker who has signed 100 successful bond issues, to the school teacher who has taught 1000 scholars, to the real estate dealer who has sold 100 lots at double profit, to the insurance agent who has taken $100,000 worth of insurance and never landed his company in a loss, or to the plumber who has set 50 toilet sets without a leak. We rather offer to the laundress, the school teacher, the banker, the real estate man, the insurance agent or the plumber, a totally different realm for their thoughts, something into which they enter as a relaxation, something that utilizes their powers of industry and handicraft, but in a wholly different world, a realm of dreams, if you like, an open space where they can forget their laundry work, their plumbing, their banking, etc., and rejoice in the things of the imagination and the beauties of nature.

Let me illustrate in the story of the London shoe clerk. For six days in the week, morning, noon and night, he was engaged in selling shoes. He had no opportunity for recreation excepting on Sundays, when he was too tired to do anything but go, in fair weather, to Battersea Park, and lie upon the grass.

One Sunday morning, a bug came out of the grass and crawled across his hand. He was surprised to see that it was quite beautiful in color—orange with black and white spots.

Next Sunday, he had a similar experience, but this bug was brilliant emerald-green. He had never thought of them as beautiful objects, but this gave him the idea. He looked about for other kinds; after several Sundays, he had at least a dozen—quite different and more or less beautiful. Then he began mounting them on pins, and he looked forward joyfully to a weekly renewal of his bug hunt.

Some friend said: "Why don't you go to the Library? There are books about these things

BOYS LOVE THE CAMP AND THE CAMP IDEA

The author addressing a group of boys on outdoor life and what is to be learned by those who train themselves to observe.

which tell their names and habits." But, alas, the Library was not open on Sundays.

Another friend said: "If I were you, I would go to the Museum and ask for Professor Huxley. He is quite sure to help you."

So the poor, scared little shoe clerk screwed up his courage to call on the famous scientist. Huxley was one of those great men who are always ready to help students and, for the time being, focus all thought on the matter in hand. He received the shoe clerk most kindly, sent to the Library for books, helped him to name his specimens, and told him to come again whenever he needed help.

So this shoe clerk found another field, a new world into which he could enter when free from his shop duties. It infused joy into his otherwise sordid life, and he kept right on till he became the best authority on the insects of the London parks.

Huxley, addressing his class, told them of this young fellow and said: "That is what I wish every one of you to do. Follow your calling, your vocation, with all your energies in business hours, but at other times have some avocation, something that your heart is in, a corner of the realm of the imagination, a big field or a little field, according to your gifts, but one in which you are the best authority, in which you are the king."

So the woodcraft idea deals not with the shoe clerk in his counter-jumping hours, his vocation, but with his avocation; not with his commercial exploits, but with his Sundays, when he was King of the Bugs of Battersea Park.

The few trades or vocations that are recognized in our official Manual, are part and parcel of outdoor life and camping, or intimately associated with them.

In giving shape to the recreational activities of Woodcraft, the founder has made a lifelong study of human instincts, recognizing in these age-old, inherited habits of the race, a weapon and a force of invincible power, never forgetting that instincts may go wrong and be a menace; also that to thwart or aim at crushing an instinct is courting disaster.

For example, the instinct to play. This dominates all young animals of high type, and gives, indeed, the training they need for their life work.

Or the gang instinct, which is the real religion

(Continued on page 318)

HOW THE INDIAN TRIBE IDEA APPEALS TO BOYS

The author believes that the gang instinct is the real religion of all boys between the ages of eight and eighteen.

Jack-in-the-Pulpit—One of Nature's Oddities

By ALBERT A. HANSEN

JACK-IN-THE-PULPIT is one of nature's oddities. Jack is a novel sort of a preacher, seemingly well equipped with a gracefully shaped sounding-board and a handsome pulpit. Botanically speaking, the pulpit and sounding-board is called the spathe and is similar to the fleshy hood that envelops the flowers of its outcast relative, the skunk cabbage. Jack himself is technically called a spadix, and he is in reality a club-shaped mass of sterile tissue at the base of which the groups of tiny flowers or florets are located. It will be noted that what is commonly called a flower is really an elaborate structure that protects a score or more of miniature flowers within.

The florets of some of the Jacks are pollen-bearing or male flowers, and the name Jack is appropriate enough. But some of the Jacks possess pistillate or female florets only, so perhaps we should call such a one Jaqueline in order to be strictly correct. Perhaps you have noticed that some of the spathes are striped, with light green bands, while others have dark purple stripes. The light green stripes frequently indicate the presence of male Jacks, while the darker striped spathes usually house the female Jacks, but there does seem to be a great deal of variation in color that is influenced by the amount of sunlight.

If we could interpret the sermon that Jack is preaching, it would probably be entitled, "Enjoy Us But Do Not Destroy Us," because the species is becoming increasingly scarcer on account of the promiscuous, thoughtless manner in which it is being picked at every opportunity. Mrs. N. L. Britton, wife of the director of the New York Botanical Garden, relates that she witnessed the destruction of over four hundred Jacks in a few minutes by a class of school children that was visiting the gardens. Under the guidance of their teacher, the little vandals tore the plants out by the roots before anyone had time to interfere! Within a considerable radius of our large cities the Jacks have been absolutely exterminated, a strange commentary on the trait of human beings that leads them to destroy the very things they enjoy. The fact that the male and female (staminate and pistillate) florets usually occur on separate plants is an additional reason why sufficient Jacks should always be left for reproductive purpose. If all the staminate plants are picked, the pistillate plants will be sterile, while, conversely, if all the pistillate plants are destroyed the pollen will be useless and no seeds will be produced to perpetuate the species. Occasionally, however, specimens are found in which the tiny little flowers at the base of the Jack include both male and female florets.

JACK-IN-THE-PULPIT

A novel sort of preacher equipped with a gracefully shaped sounding-board and a handsome pulpit.

The picturesque spathe (the combined pulpit and sounding-board), folds over in the form of a flap in the front. Have you ever forced this flap open and peeped within? You will probably be furnished a surprise in reward for your investigation. You will discover that toward the base of the spadix (Jack himself), a swelling occurs that reaches almost to the walls of the spathe and thus forms the ceiling of a little chamber that is decorated with clusters of either male or female florets. The surprise that may be awaiting you is the presence of dead flies within the chamber, because it not infrequently hap-

pens that the little pollinating insects are trapped in the tiny room destined to become their sepulchre.

After the female florets have been pollinated

FRUIT OF JACK-IN-THE-PULPIT

The berries are bright red in color. Note the withered remains of the spathe.

through the agency of gnats and flies, the spathe gradually expands and eventually drops off, the fleshy spadix shrivels and each little floret develops into a bright-red berry. By midsummer all that is left of Jack and his pulpit is an ovoid cluster of bright berries around which the withered remains of Jack may frequently be found. It is said that the berries were formerly boiled and eaten by the Indians, but the bright coloration is intended by Nature to attract wild animals that will scatter the seeds in return for the food provided by the enveloping pulp. The Jack is a canny sort of a chap, however, since he does not depend entirely on seeds to reproduce him. During the summer he is very busy manufacturing food, and all the excess food is thriftily stored away in a bulb-like, below-ground structure called the corm. The following season the food that is stored in the corm develops new shoots, and so Mr. Jack is carried safely over winter, even though the entire seed crop of the previous season may have been destroyed. It is for this reason that, when a Jack-in-the-pulpit is picked, the flowers alone should be removed and the corm should be undisturbed. But too often the thoughtless collector tears out the entire plant, roots, corm and shoots.

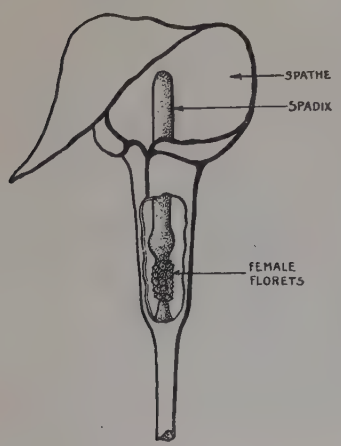


Diagram of the Jack-in-the-Pulpit

The common name Indian turnip, frequently applied to Jack-in-the-pulpit, refers to the fleshy corm, which was formerly boiled and used for food by Indians. The reason for boiling will become perfectly apparent to anyone who will take but a single bite of the raw corm or turnip. Wait a few seconds before taking a second bite and the entire mouth will soon be aflame with a painful, stinging sensation. The trouble is due to the intensely pungent juice, but fortunately the burning sensation passes off in a few minutes. Boiling takes the sting out of the corms, so they may be eaten without discomfort, although it can hardly be said with pleasure since they are decidedly lacking in flavor. It cannot be denied, however, that the little turnips are nutritious, since they are rich in starch. Some folks claim that the sting can be taken out of Indian turnips by drying, but

SKUNK CABBAGE

Would you suspect this lowly plant of being a close relative of Jack-in-the-Pulpit.

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The Seven Ages of Trout

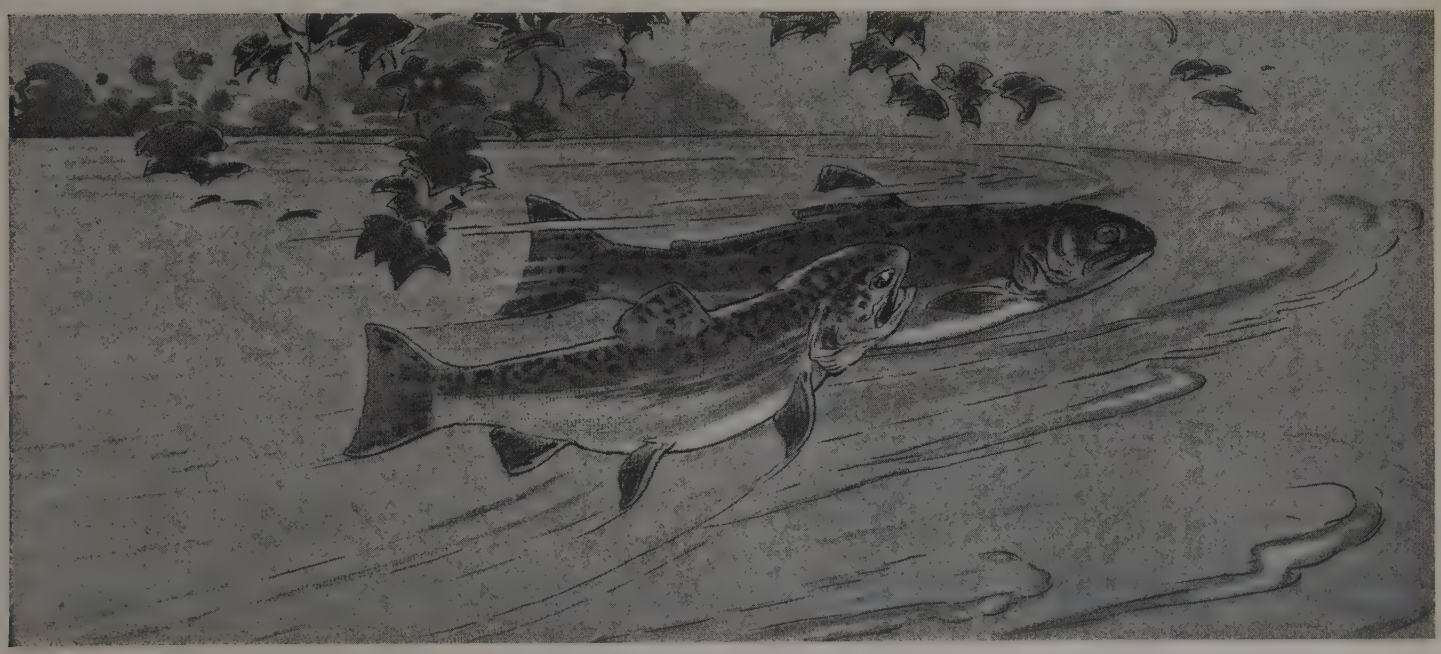
By LOUIS RHEAD

Illustrations from drawings by the author

All the brook's a stage, and speckled trout merely swimmers, and one trout in his time plays many parts, his acts being seven ages.

'TIS THE willow tassel-time of spring and on the pebbly bed of a clear, cold mountain brook is a nest full of eggs placed there by a careful mother in the most ideal situation for the future growth and development of the young infant trout. If you are fortunate enough to be there at the right time and peep down, you will observe the tiny infant struggling to get free by splitting open the egg. First to get out into the water is the tail which wags helpless about until the bulky head is entirely free from the shell in which it has been confined all winter.

As yet, the infant is more like a tadpole than a fish, much too weak to search for food. So it is that Nature provides a wonderful means of self-feeding by placing on its breast a round sac, or yolk of the egg. For a few weeks the young infant lies helplessly on its side in the pebbly sand—"bottle-fed," so to speak, gaining blood and strength till the yolk-sac is empty. During that time the body grows more shapely, the large round eyes seem to shrink, and the infant begins to realize it is time to leave the dark sandy bed of the brook and get some practice with tail and fins in swimming the rippling waters, for it needs to be vigorous and well prepared to enter an independent career. In a little while we see the infant searching round about sticks and stones after bottom creepers—then, more bold, goes swimming with head up stream after some of the plump little larvae that come drifting down along the surface. The first taste of natural food seems queer to him, but after several trials he likes it so well as to gobble every small creature in sight. His growth is so rapid, that at two inches long, he becomes aware that he is a desirable tit-bit for the many enemies that surround him who are bent upon his destruction. In addition to his adroitness in the capture of food—he must use skillful cunning to evade capture. See him disappear—as if by magic, at the approach of an eel or the wily crawfish. He is not near large enough to be afraid of the boy angler, the king-fisher, heron, mink and other creatures that later in the season will all eat their share of infant trout. Every day he gains more wisdom to watch and carefully avoid the many big trout or chub who leave their haunts of a deep hole at evening to forage and slaughter without mercy; so he feeds with redoubled energy hoping the time will soon come when he is big

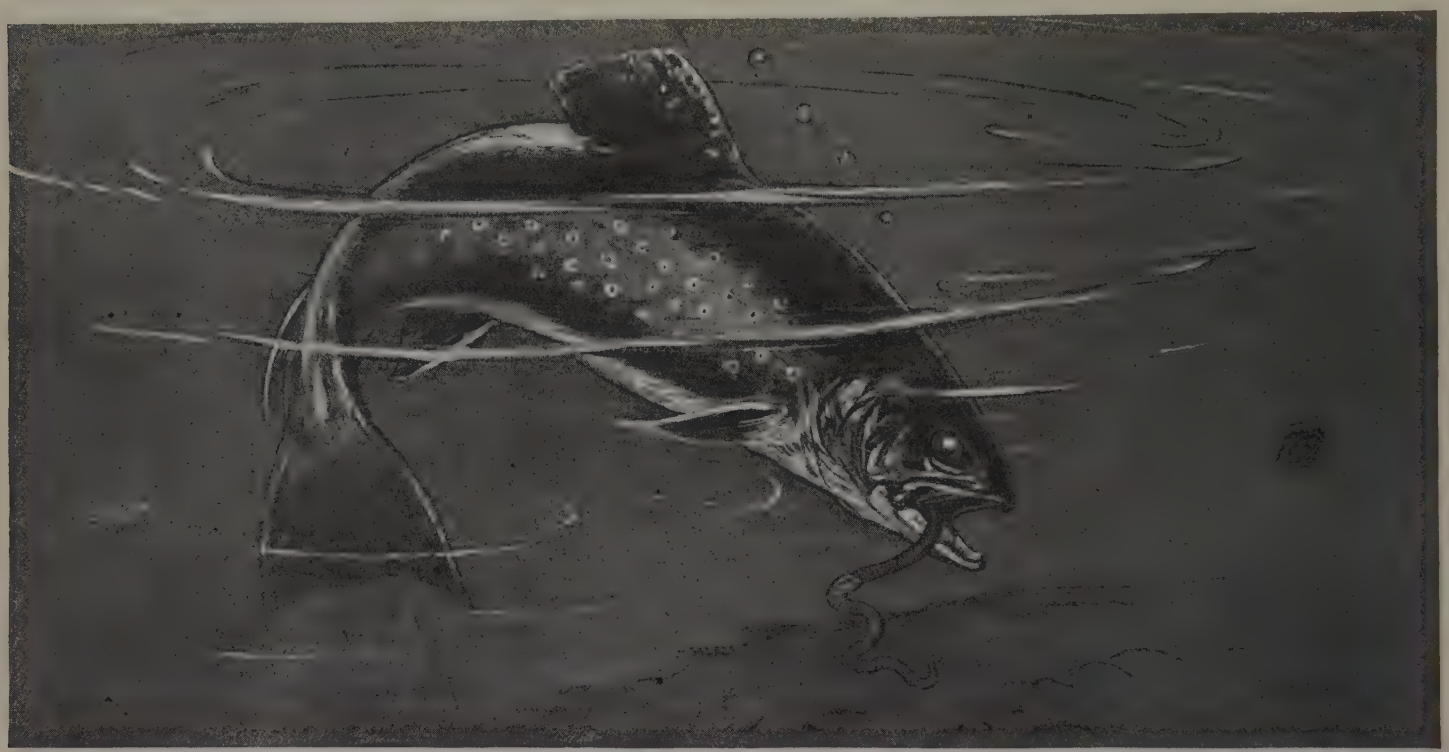


THE FIRST AGE

At first the Infant under legal size, that oft is captured and to the water not returned.

enough to glide down from the brook during a freshet and join the brimming river where there is more food, a wide range, and safer abode to enter the school of life for a proper education; just when he gets to be six inches long, the legal size, a skillful angler might capture him.

We now find the schoolboy trout taking lessons from Dame Nature and his instinct as guides along the dangerous pitfalls of life; after many narrow escapes and adventures he attained the goal of his desire. He is now grown shapely in form, a true Salmo fontinalis, lithe and graceful in movement—very different from the infant's abnormal head on a small body. He still wears the dark bars of youth across his sides, which already show the lovely red and blue spots and the cream-colored fins edged in bright orange. His great round baby eyes appear smaller, though grown keen to avert danger, for he no longer haunts the brookside shallows, nearby, where the nodding violets are hanging over the water's edge. He has now become shy indeed, prefers to get away from sunlight and lie under the protecting roots of trees—or beneath a shelving rock from whence he dashes upwards after the wing-cocked insects that float along like miniature yachts on the surface of the stream. His school hours are not limited, his time is fully occupied both night and day for two purposes—evading his enemies, and taking in all the food available. He is now fully aware of the dangerous rod or pole carried by the sharp-eyed wicked boy that creeps through the bushes well supplied with luscious worms to tempt him. A delicious morsel is that wiggling worm, so rarely seen in the rippling water of the brook. He has tried more than once to nip those worms from the curved barb that seems to be fashioned just right to slide down his gullet along with the worms. Once he did manage to gobble one; in a second he found himself yanked out of his watery abode, but fortune was kind to let him flop back to the water. It was a narrow squeak and he made a vow to take no more chances in the presence of boys and their poles, however juicy and nice their worms might taste.

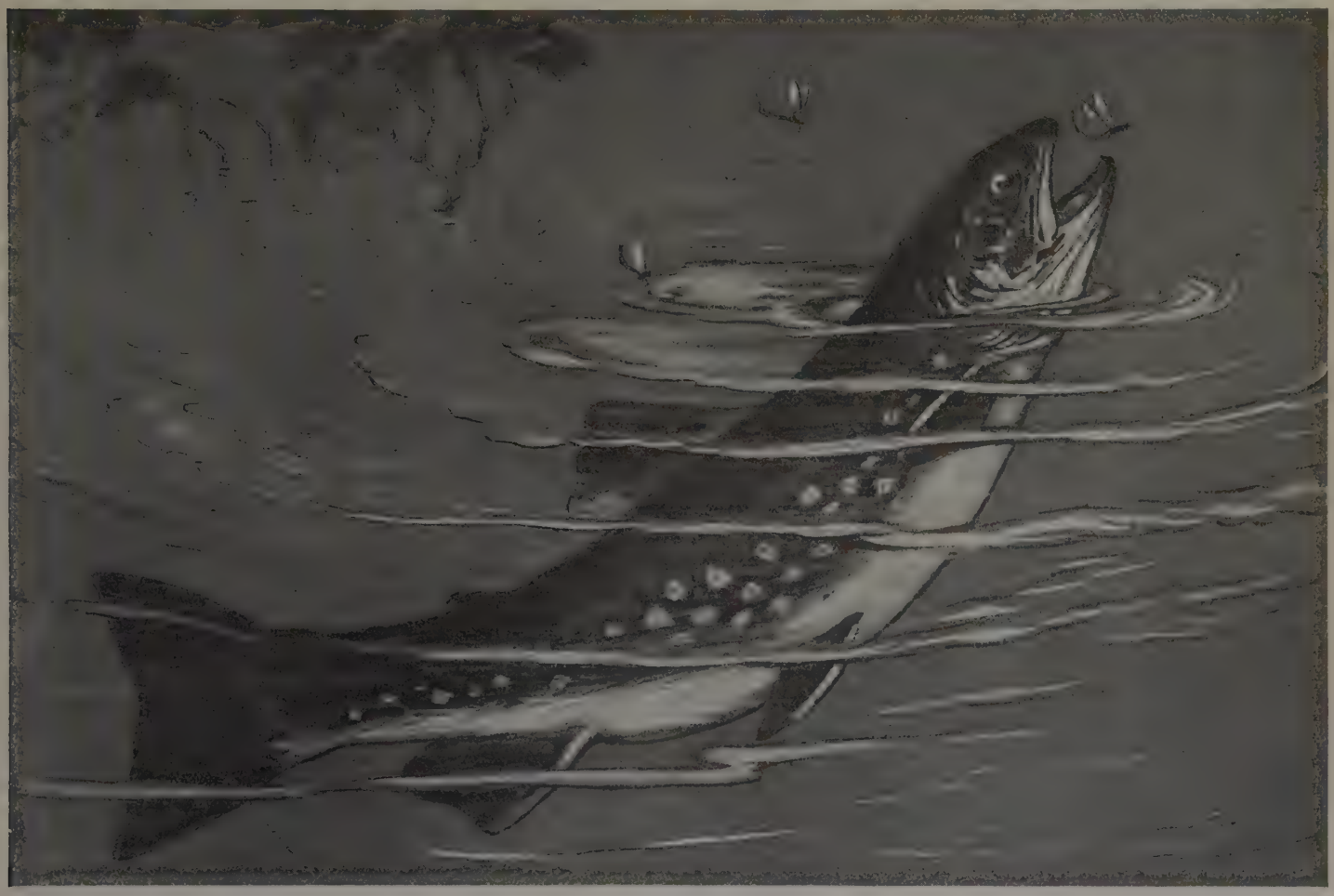


THE SECOND AGE

Then the Schoolboy at shining morn gobbles down a juicy worm and proceeds to frolic all day long.

Abundance of summer feeding finds the schoolboy trout has grown big and strong. His sides bulge out with healthy roundness, and in troutland—it is not spring—but in the fall "his fancy lightly turns to thoughts of love." He had become dissatisfied with the meagre fare of the brook, and so determined that when the heavy rains of May caused the brook to rise in a roaring flood he would make the venture and run down into the big river for greater freedom and wider space, without serious thoughts as to how the change of environment would affect him—good or bad. When he got there in his travel up stream he soon became aware of entirely new trials and dangers to encounter, for he found all the larger

trout in the most desirable situations, savage and distrustful of the handsome young stranger's appearance among them. Driven from one place to another he hardly knew what to do or where to find a snug place to rest and feed. He was mortally afraid of the big fellows, especially the ugly brown trout that showed fierce teeth with which Nature had not provided him. One comforting thing consoled him, he knew his old brook enemies would be powerless to do harm to him in a wide river with deep holes, big rocks, swift surging up for a supreme effort to leap above the surface. The young trout perceived two other flies going along at the same speed and made an effort to get one—unaware an expert fly fisherman up above on the riverside was holding, and about to capture the great trout from his favorite haunt, familiar to the fisherman as a good pool. The great trout was seen no more by the young, yet startled lover, who at once decided to occupy the now vacant haunt, and take heed the angler did not likewise capture him. Almost every day other



THE THIRD AGE

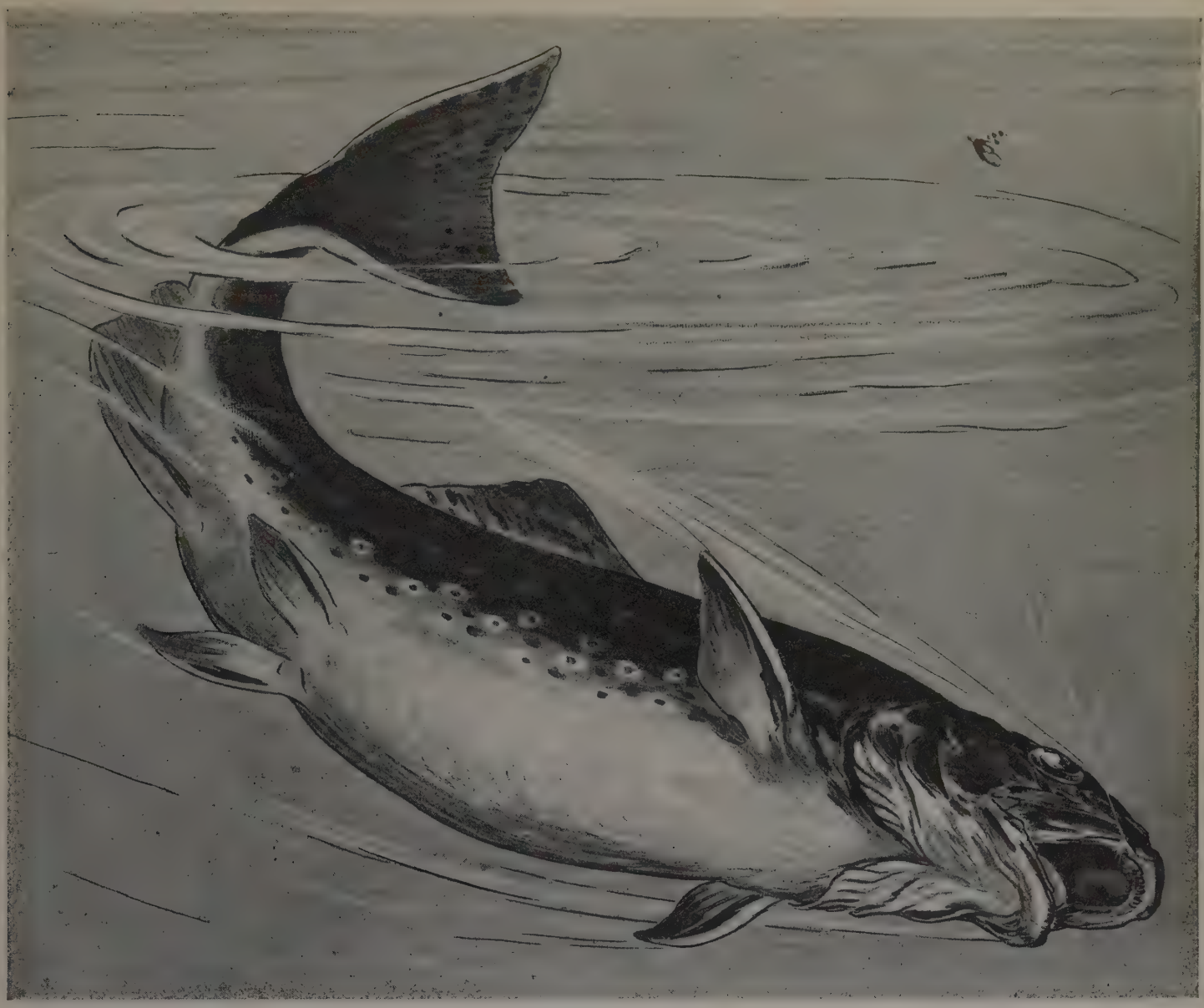
And the Lover, sighing like a furnace, makes a woeful plop at a fluffy fly hovering over the brook.

ing waters. All he wanted was a safe retreat where he could be undisturbed and rise throughout the day and night to the hosts of insects that floated overhead down the rushing waters. Onward he sped, and at last got to a mighty rock, just in the middle of the stream, when the water surged past each side forming a round blanket of white foam on the surface. Just as he was satisfied this would make an ideal haunt to abide, he saw a great trout rushing at a tremendous rate to the river bed, rooting his nose among the pebbles vainly trying to tear out a barbed fly fast to his upper lip. Failing to get free, the great trout went dashfish came to contest the rights of that ideal place, but after many battles, he at last became sole occupant of the pool. In that fruitful place he gorged day and night till the fall of the year when in all his youthful vigor and strength, in brilliant array he left his favorite haunt in search of a mate.

The long, cold winter is at hand and the ardent lover has become the parent of six hundred infants whom he will not see—and if he did, would strike among them for a hearty meal. He is now about to change quarters to the bed of a deep pool where the water is least affected by freezing tem-

THE FOURTH AGE

Then the Soldier, full of strange foods, sudden and fierce in quarrel, seeks a bubble reputation in front of a rod tip.

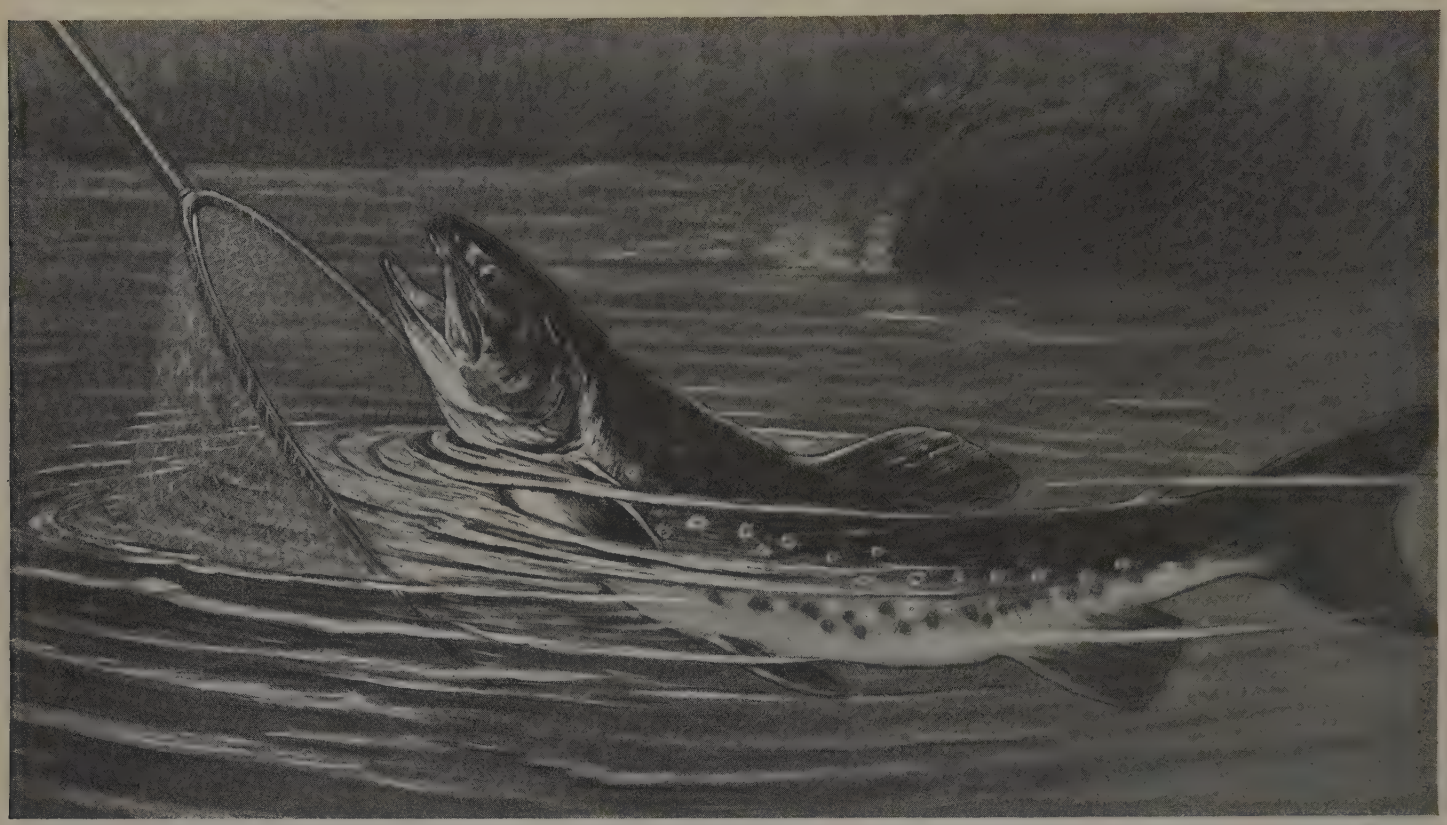


THE FIFTH AGE

And then the Matured One, with fair, round belly, with minnows laden, full of wise surges and tricky ways.

perature, there to lie dormant with other aquatic denizens, most of the time to be unconscious of any happening, of frost, snowstorms, ice jams, then, at springtime to wake up with advanced ideas of his prowess. No longer the young modest lover, he is very hungry, dominant, ready for a fight, in fact a soldier of fortune flushed in the pride of vigorous adult trouthood he awaits with impatience the awakening of aquatic life that comes immediately after the melted snow-water has run down to the sea. Not so lusty as in the fall, his broad shoulders and sides are narrowed down by winter's fast, his appetite craves for more varied diet. With a body fifteen inches long he can take in his maw, with ease, a young muskrat, a four-inch minnow or trout, and would not despise a frog. The pugnacious crawfish that scared him in infantile days would find life very short once he got its tail between his wide jaws.

On the very day the temperature is just right, he moves away from the dark winter pool, and during the journey up stream he looks keenly about for helgramites and other bottom creatures who, like him, have their spring appetite on keen edge. The river is big, a torrent of rushing muddy water, but he darts onward towards the big rock, his favorite haunt of a season past which he finds to be just the same as of yore. He is familiar with every pebble and stone, curving eddy and cross-current. A bunch of young dace resting quiet from the torrent, in a flash scatter in all directions at his approach. His size, his very demeanor is instant proof their doom is sealed should they linger within reach of his lightning darts.



THE SIXTH AGE

The sixth age shifts into the lean and aging trout, still wise, still tricky, but lacking the strength of youth.

The river soon runs gradually down to its normal size, though insects are still scarce, fighting shy of the cold April blasts, so the only food available are bottom creepers. Halcyon days are near, the lovely month of May ushers in the warm sun, and anglers begin to wade the riverside casting their worms and flies. The bold, yet crafty soldier trout is fully aware of their snares, for several times has he been nipped yet managed to get free, by inefficient efforts of the angler.

One time he made a savage dash at an artificial minnow that was played along the surface by an expert, and got fairly hooked in the lower jaw. Thoroughly angered, he swam at full speed twice around the big rock, tightened the line, with a supreme effort leaped above the surface that cut the line, which immediately obtained his freedom. Hurrying away for a considerable distance, he wandered about homeless, with the barbed minnow still fast to his jaw and the line trailing after. For many days that minnow tortured him. At every sharp-edged rock he rubbed and rubbed to get free from the obnoxious hook which at last came off along with a piece of bone and flesh. After many days he returned to his lair again to meet the angler, his rod, and his lures.

The fifth age finds our justice domiciled in a very different situation than he occupied as the soldier, more in keeping with his rounded form and jovial disposition. His previous characteristic, impetuosity is replaced by a sedate though wobbly dart in taking his food at night. He has chosen a lair far down the river, where the water is wide, slow-moving and very deep, midst great boulders and rocks.

Numerous and varied are the neighbors round about him—large and small chub, many bass swim leisurely by to now and then poach his favorite feeding place to steal his dace and shiners. Great suckers are everywhere licking the rocks or lying flat on the pebbly bed. Grown extremely wise and solemn the justice never moves while the sun is up; after sundown, when night-moths flicker on the surface, you can perhaps see or hear periodic splashes, a proof that he now dines. It is not a hurried function, but continues throughout the night.

All the other denizens of his lair are familiar with his habits and have profound respect for him. His size commands it. The curved hook on his lower jaw has a sinister appearance and the weighty look of his broad shoulders and ponderous belly does not encourage or permit any interference with his actions or feeding, from setting sun till dewy morn. No angler can seduce or tempt him from his abode whatever skill or lures they employ by day at that time. He may be dreaming or asleep, he certainly is not responsive

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Spring in the Burrows

By THEO. H. SCHEFFER

Assistant Biologist, U. S. Biological Survey

THE APPEARANCE of only a single swallow is proverbially considered to herald the near approach of spring. But long enough before this bird has twittered its first twitter there are other notes, and sights and scents that trap the senses of the average human who looks eagerly for a sign. How about the first fly that drones against the dusty windowpane, from which the fretwork of frost lines has scarcely yet disappeared? Or the gurgle of the first frog that blinks his goggle eyes above the mud and exults at finding his bellows again in working order? Then there is the faint and healing fragrance of the swelling cottonwood buds and the loud burr of the flicker's drill as he challenges his neighbor to risk a headache at the game of Dig for Your Dinner.

All these signs and many more we may note, long before the swallow swallows the fly. But we usually take less account of the renewal of life beneath our feet, except as to the grass and herbage they touch.

Beneath the grass roots, in favored situations, are branching galleries in the firm subsoil; in the hillocks and ridges, and underneath the logs, fences, and stumps are nice dry spaces for nests of soft materials, where the smaller mammals of many species have been wintering. Not to be tedious in rambling discussion, we will confine ourselves to two of these—the mole and the pocket gopher.

The real living quarters of the mole are in the deeper parts of its runways, from which passages slant upwards here and there to the shallower hunting paths that range widely just beneath the sod or the soil crust. In the drier situations of these deep runways, usually where they are not disturbed by our agricultural operations, small chambers are excavated for holding nests of fine, dried grass stubble, mixed with leaves when obtainable. In these the mole sleeps, if such an active animal ever finds time to rest from his labors. He eats his meals wherever he overtakes them and washes his face in the dew of the grass when he occasionally ventures out of the runways at night for a slight change of diet.

THE EASTERN MOLE

He eats his meals wherever he overtakes them and washes his face in the dew of the grass.

A MOLE RIDGE IN A SANDY FIELD

The shallow hunting paths which range widely just beneath the sod or the soil crust.

After a little spring housecleaning, repairing old tunnels and extending the reach of some of the hunting paths, the stork, or some other fabled bird, has its innings. Not in the sheltered quarters we have just described, but in rudely constructed beds or open nests of half-green grass stubble and rootlets, the young of the western mole are brought forth in early spring. Such nests, in pastures and meadows, are to be found in enlargements of the hunting paths just be-

neath a thick roof of sod, where they may receive a certain amount of warmth from the penetrating rays of the sun. Good drainage has also been provided for by locating the nurseries in the smaller knolls and ridges of the open field. In an eastern state the writer once found such a nest in a piece of breaking, where the sods had only recently been tilted over by the plow.

NEST OF BABY MOLES

Such nests are found just beneath the thick roof of sod.

The number of young in a family is most often three in the case of the larger western mole, and four with the common eastern species. Both east and west they are born in the latter half of March and early in April, within a period of about three weeks. When quite young they resemble nothing as much as themselves, being naked, blind, fat, wrinkled, and with an exaggerated proboscis. However, since the fond parents cannot see them they are probably nurtured with tender care. At any rate domestic trials are soon over, for the young develop and grow with astonishing rapidity. Within a few weeks, in the latter part of May, we find them already on the hunting grounds, fully furred and so well grown that an ordinary observer would not be likely to distinguish them from the adults.

The runway system of a pocket gopher, like that of a mole, has its shallower extensions ranging over the feeding grounds, and its deeper parts where the owner may find seclusion and shelter. In the case of either animal the shallower system of runs is quite extensive, sometimes hundreds of feet in total length of mains and branches. Both the mole and the gopher in this way find their food underground, the former as a true hunter in his pursuit of living grubs and worms while the latter goes about it as a mining prospector in search of some succulent roots.

Spring activity in the gopher's burrows is quite marked. Runways must be extended in search of fresh root supplies, for the remnants of the older food stores are no longer to the animal's liking. Dandelion tonic seems to be especially sought, since pocketfuls of the delectable greens are gathered with apparently reckless consideration of actual needs. Spring house cleaning is easily accomplished, in the fashion of the untidy housewife, by sweeping the dirt into the corners and under the furniture. In other words, the gopher disposes of all rubbish and refuse by packing it into unused tunnels or sealing it up with fresh earth in pockets excavated for the purpose.

Associated with the feeding runs of the pocket gopher are the food stores, in cavities of various sizes hollowed out in the earth. But the nesting chambers are usually deeper down, especially in well-drained soil. Those discovered in digging out runways on gravelly prairies in the west were generally located at depths of from two and one-half to four feet, though the passageways themselves sometimes reached a lower level of five feet or more. By contrast, in low meadows of the Willamette Valley, Oregon, nests with young gophers were found within six inches of the surface.

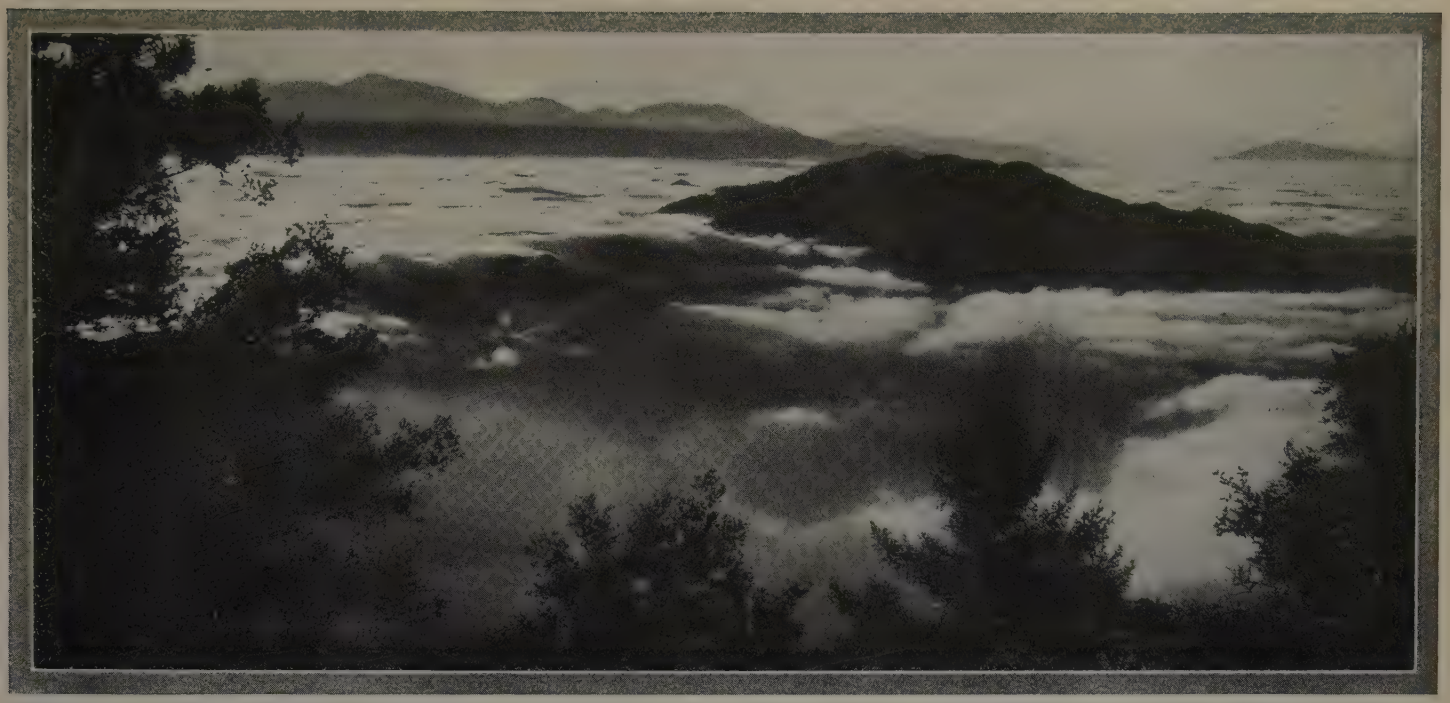
These nurseries of the gopher, in contrast to those of the mole, are hollow balls of fine dry grass and shredded stubble, filling a chamber of five to eight or nine inches in diameter. This chamber usually has at least two entrances, and in close connection with it are one or more pockets for the storage of a small quantity of food.

MOLE MOUNDS ON SWAMPY GROUNDS

Good drainage is provided by the mole for its nurseries by locating them in knolls and ridges of the open field.

The period of domestic relations among the gophers extends in general through

(Continued on page 296)



Photograph by F. Ellerman

A FOG-FILLED VALLEY IN CALIFORNIA

The photograph shows clouds or fog cascading through the Last Fork Cañon and into the Santa Anita Cañon.

How About Collecting Weather Exhibits?

By CHARLES FITZHUGH TALMAN

U. S. Weather Bureau

COLLECTING weather is a hobby that hasn't been much cultivated. The broad earth has been combed for beetles and butterflies, fossils and meteorites, Indian arrowheads and Babylonian baked-clay tablets. The museums are bursting with musical instruments, mummy-cases and Megalosauruses. The very voices of aboriginal story-tellers have been captured with the phonograph and stored away for the edification of posterity. But all museums ignore weather. You will search the Smithsonian Institution in vain for specimens of Dakota blizzards and Kansas tornadoes, Sahara duststorms and London fogs.

I admit there might be some trifling difficulties in the way of bagging such game, preserving it in alcohol, and shipping it by parcel post to a scientific repository. I confess I do not know how, if some philanthropist should be seized with the happy idea of founding the first Weather Museum, the preparators of the establishment would solve the problem of mounting and arranging for public inspection all the objects that such an institution ought to contain. A rare species of wind, for example, would be a pretty hard nut to crack, while a dead calm would be even more of a poser. No matter. Imagination can brush away all difficulties. One fact is clear—a Weather Museum would fill a long-felt want—and therefore we shall lose no more time about assuming its existence.

Perhaps you think weather is pretty much of a muchness; but once you have entered the portals of the W. M. you will discover that it is, in fact, more variegated than the circus or the Sunday Supplement.

Suppose we begin with the Wind Section.

We hurry by such commonplaces as trade winds and monsoons; bestow a passing glance upon the damaging hot winds of the plains and the exasperating east wind of Boston; linger but a moment before the pampero and the harmattan, which stir memories of the school geography.

When we come to the glass case that contains a cross-section of the "anti-trade" we shall begin to take notice. The home of this wind is thousands of feet above the earth, for it blows directly above the trade winds and in the opposite direction. A still loftier member of the wind family is the "upper trade wind." It dwells some eighteen miles above sea-level, and precious little is yet known about it.

There are winds which, like the gorilla and the tarantula, one would rather encounter in the shape

of museum specimens than in real life. Such is the wind that made Seistan, in Asia, famous—the "bad-i-sad-o-bist roz," or "wind of 120 days." It blows with appalling violence from May to September, creating a perfect pandemonium of noise, sand and dust. A British explorer describes it as

CLOUD FORMING OVER A FOREST FIRE

This is not merely a smoke cloud but a real water cloud, a formation which frequently occurs.

"the most vile and abominable wind in the universe." Another dusty wind, the "brickfielder," hails from Australia. The simoom, of Asian and African deserts, owes its celebrity not only to its dustiness, but also to the fact that everybody misspells its name. The "devils" of the Indian and South African plains are dust whirlwinds, and so are the "twisters" of Texas.

The "foehn" is the most celebrated wind of the Alps. It is intensely dry and warm and is most noticeable in winter, when it causes the snow to vanish as if by magic; whence it is nicknamed the "snow-eater." This parching wind reduces all woodwork to the condition of matchwood, and increases the danger of fire to such an extent that, in some districts, all domestic fires, even to a lighted cigarette, are prohibited while it is blowing. Similar winds are found in other mountainous countries. In the western United States and Canada they are called "chinooks."

The Wind Section contains, say, five hundred specimens. From the Alps alone come scores of interesting local breezes, each having its own name and many forming the subject of curious legendry. Then there are the "kite and junk winds" from Siam, squally "williwaus" from Tierra del Fuego, the enervating "levanter" from Gibraltar, the shivery "mistral" from the south of France, the boisterous "bora" from the Adriatic, an invigorating "doctor" from the Cape of Good Hope, a "black northeaster" from New Zealand, a "wind called Euroclydon," like that encountered by the apostle Paul. . . . But we must not embark upon a long-winded catalogue.

Juvenile visitors will hover with delight over working models of the tornado, the typhoon and the waterspout. (Such models have actually been made.)

The Cloud Section is a treat for the eye as well as the understanding. Behold a magnifi-

Photo by Juan Keidel

NIEVE PENITENTE IN THE ARGENTINE ANDES

The snowy columns look like a throng of human figures attired in long white robes.

cent "cumulus," or "woolpack" cloud—with the proverbial silver lining! Even more majestic is the towering "cumulo-nimbus," or "thunderhead"; while the feathery "cirrus," or "mare's-tail," and the dappled "cirro-cumulus," or "mackerel sky," furnish bewitching patterns, in endless variety.

Far less familiar are the curious "noctilucent clouds," which have been seen shining through summer nights in the years following great volcanic eruptions. Some authorities suppose them to consist of volcanic dust, floating so high above

the earth that the sun never sets upon them. Another rarity is the "pocky cloud," otherwise known as "udder cloud," "sack cloud" and "rain balls." Its scientific name is "mammato-cumulus." It is an occasional feature of thunderstorms, and its bulging, pendulous "sacks" make a bizarre picture.

There are famous local clouds, just as there are famous local winds. No first-rate weather museum would fail to display an example of the well-known "Table-cloth," which sometimes overspreads the flat top of Table Mountain, near Cape Town. Often this white sheet of cloud hangs part way down the steep side of the mountain, and the picture is all the more striking because a perfectly clear sky usually prevails overhead when the Table-cloth is seen.

The "Helm and Bar" of Crossfell, a mountain in the north of England, are near relatives of the Table-cloth. These clouds appear when the boisterous blast known as the "Helm wind" rushes down the mountain. The Helm rests on the summit, while the long, slender Bar floats in the air a mile or more to the leeward. There are many other mountains throughout the world that are always capped with clouds under certain conditions of wind and weather.

Do you know that a big fire often produces a cloud above it—not merely a cloud of smoke, but a real water-cloud? Such clouds are seen over forest fires, and sometimes over burning towns. It is alleged that in some cases a genuine rain-cloud has been thus produced, and that the resulting shower put out the fire that caused it.

A fog is a cloud on the ground, and therefore fogs belong in the Cloud Section. One advantage of building our museum out of pure imagination is that we shall have no difficulty in arranging, on a shelf, a series of glass jars containing samples of all the famous fogs of the world. Here we shall see a bit of vapor from the Newfoundland Banks; a pint of "London particular," of the peasoup variety; a specimen of "frost-smoke" from the Arctic Ocean; and a jarful (marked "Dangerous") of the frozen "pogonip" of Nevada, charged with

Courtesy of C. Stewart, Pretoria, S. A.

THE FAMOUS "TABLE CLOTH" ON TABLE MOUNTAIN, SOUTH AFRICA

Often this white sheet of cloud hangs part way down the side of the mountain while the picture is made more striking by a perfectly clear sky overhead.

ice needles which, say the Indians, are death to the lungs. Lastly, let us not forget the dirty, foul-smelling "painter" of the Peruvian coast, which coats the white paint of vessels with a slimy deposit, said to come from decaying marine organisms killed by cold ocean currents.

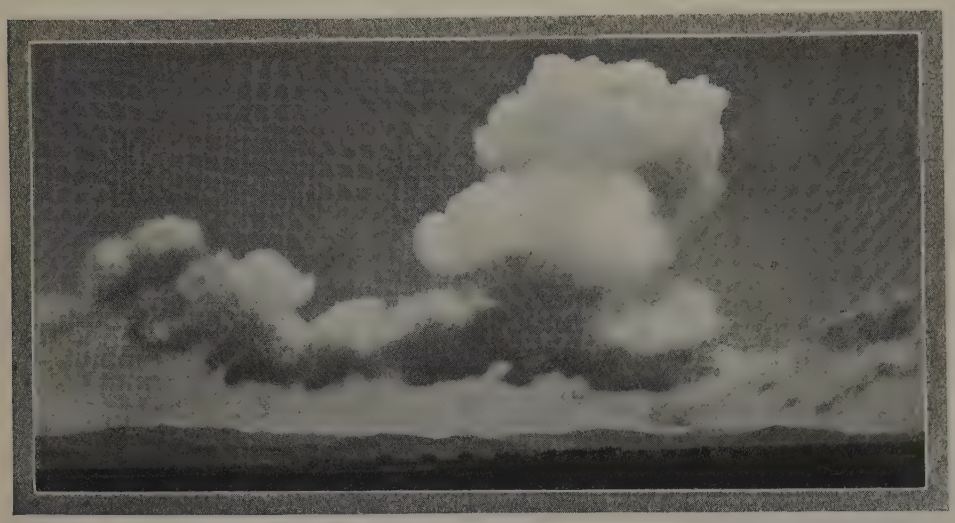


Photo by Dr. W. T. Lee

A "WOOLPACK" CLOUD BUILDING UP A "THUNDERHEAD"

This is the cumulus and is quite familiar to amateur weather experts.

The curator of clouds and the curator of rain had to toss a penny to decide who was to have the custody of "Scotch mist," which is half way between a fog and a shower. The same may be said of the "garúa," the wet fog of the Peruvian "rainless" coast. This fog keeps vegetation alive, and makes ample amends for the lack of rain.

The name "cloudburst" suggests another possible dispute between members of the museum staff; but the term is a misnomer. A cloudburst is simply a very heavy rainstorm; especially one occurring among the mountains.

Rain from a clear sky is an uncommon phenomenon, but there is no mystery about it. Small raindrops fall very slowly through the air. They may require several hours to reach the ground, and in the meantime the cloud from which they came may have dissolved or passed beyond the horizon. Such rain is rare because very small drops generally evaporate long before they get to the earth.

The Snow and Ice exhibit is one of the largest in the museum. First of all we have microscopic views of snow crystals—hundreds and hundreds of different types—to say nothing of the varied vegetation that Jack Frost paints on the windowpane, and the beautiful "ice-flowers" that form in a block of ice in the process of melting. Then there are "ice-flowers" of another kind needing no microscope to reveal their beauties, myriads of which sometimes form on the frozen surface of a lake or other body of water.

Photo by David Fairchild

DEPOSIT OF "GLAZE" ON A TWIG

Photo by T. J. Moon

SNOW ROLLERS

These muff-shaped wind-blown snowballs sometimes form by thousands on fields or lawns.

Red snow will interest every museum visitor. Sometimes it is reddened by dust, and sometimes by a minute vegetable organism that thrives in the coldest climates.

"Sastrugi" are long dune-like ridges of snow, formed by the wind. They form an annoying obstacle to sledging in the polar regions. Wind is responsible for many other curious forms of snow. Among them are the

rare "snow-rollers," natural snowballs rolled by the wind and mostly shaped like a lady's muff. Sometimes they attain the size of a barrel, and they have been found in thousands on gently-sloping hillsides.

The "snow garland" forms first along a straight tree branch or windowledge. Then, as the strip of snow softens, it slips down in the middle like a sagging rope, but continues to be supported at the ends.

Snow in the form of columns or pinnacles is found on mountains, especially within the tropics. The most striking examples occur in the Andes. At a distance the snowy columns bear a weird resemblance to a throng of white-robed human beings, taking part in some religious ceremony; whence this formation has earned the Spanish name of *nieve de los penitentes* ("snow of the penitents"), generally shortened, for international use, to *nieve penitente*.

Photo by F. Ellerman

SINUOUS LIGHTNING

Before the days of photography such lightning was thought to be zigzag. Note the black flashes due to reversal of image by double exposure; a common trick of the camera.

Hailstones of all shapes and sizes figure in our museum—preserved from melting by a process that unfortunately has not yet been invented—including those huge ones formed of several that have frozen together after reaching the ground, giving rise to some tall stories. Wires and tree branches heavily coated with the form of ice known as "glaze" make a fine display.

A profusion of wonders is provided by the electrical and the optical phenomena of the atmosphere. Under the former head come the many varieties of lightning. There is the sinuous form that used to be described as "zigzag," until the camera proved that lightning has no sharp angles. There are the broad strips of "ribbon lightning," and the bright points, like strings of beads, known as "beaded lightning." There is "sheet lightning," which is mostly a mere reflection on the clouds of distant "streak lightning"; and there is the very rare "rocket lightning," which shoots slowly through the air after the manner of a sky-rocket. "Ball lightning," which floats in the air near the ground and sometimes enters houses, is one of the unsolved mysteries of Nature. A silent electrical discharge on a vast scale is said to light up the summits of certain mountains, and it has been named "Andes lightning."

The various strange effects produced by lightning deserve ample illustration. They range all the way from "fulgurites," the glassy tubes formed by the passage of lightning through sand or rock, to "lightning-prints," which are occasionally found on the bodies of persons struck by lightning, and were formerly reputed to be photographic images of trees or other objects in the vicinity. As a matter of fact, the lightning-print's tree-like form is due to the branching of the electrical current as it passes through the tissues.

St. Elmo's fire, the flame-like appearance seen in stormy weather in the rigging of vessels and on lofty terrestrial objects, is nearly akin to lightning; while the aurora, in its many beautiful forms, is the most ambitious electrical display produced by Nature.

The marvels of atmospheric optics are about a hundred times more varied than the average man supposes—until he has had the privilege of entering the Weather Museum. Do you know that there are a score of different rainbows; including reflected bows, intersecting bows, supernumerary bows, white bows, and bows in a wide range of colors? That there are at least fifty different kinds of halo, some of which have been seen only

once or twice in the history of science? That besides the mirage of the desert, depicted in the school-books, there are many other forms of this delusive phenomenon, including the wonderful Fata Morgana traditionally associated with the Straits of Messina? Do you know that there are a dozen different phases of twilight, all classified; including the beautiful sequence of light and colors seen in the "Alpenglow"? Have you seen the "crepuscular rays," one variety of which gave rise to the Homeric description of "rosy-fingered dawn," and the "anticrepuscular rays," which appear to converge to a point directly opposite the sun? Have you ever beheld a genuine "Brocken spectre"—your own shadow, cast on a bank of fog, with a colored "Brocken bow" around the head?

Photo by J. Pessagno

LOOK OUT!

When the "pocky cloud" appears in the sky conditions are generally favorable for violent thunderstorms or tornadoes.

Come to the Weather Museum. You will find a great many more things to interest you than I have space to mention.

Spring in the Burrows

(Continued from page 290)

March, April, and May. Apparently the orderly progress of courtship in this group is somewhat delayed by the solitary existence of the individuals, which precludes frequent trysting. The average family in the several species is larger than that of the mole, numbering commonly five or six and ranging with the individual from three to nine. We have as yet only scant evidence that the female gopher may twice become a mother in the same season.

THE POCKET GOPHER

Sometimes the shallower portions of the gopher's runways underground are hundreds of feet in length of mains and branches.

The young of the gopher, though naked and blind, are not so grotesque looking as the baby moles, which, as if conscious of their uncouth infancy, hurry through this period of life considerably faster than the gophers. The latter may be distinguished from their parents for many weeks after they make their appearance in the feeding runways, and even in the late fall they are not always fully grown.

With these observations on two groups of the smaller burrowing mammals we will close a chapter that might be much expanded, to include others.

Our White Pine—A Famous Tree

(*Pinus strobus*)

By L. W. BROWNELL

THE WHITE pine is the tallest conifer of the northeastern states and probably averages taller than any other tree of that region. According to Williamson, in his History of the State of Maine, many white pines have been seen with a trunk at least six feet in diameter and over two hundred and forty feet in height, and those whose trunks were more than four feet through were exceedingly frequent. This history, however, was written of conditions that obtained nearly, if not more than, one hundred years ago, and today it is rarely that a tree exceeding one hundred and fifty feet in height is found and, indeed, those of that height are far from numerous. The average is from ninety to one hundred and thirty feet with a trunk diameter of from two to three and one-half feet. In crowded conditions the trees have small crowns, their trunks growing straight and tapering slowly to the tip. They are free of branches often for more than two-thirds of their height. In the open, however, the trunk frequently divides into two or more upright limbs at a short distance from the ground. These bear spreading branches in whorls, beginning near the ground in many instances and forming a large, broadly conical crown.

WHITE PINE

The needle-shaped, three-sided leaves are borne in clusters, or bundles, of five. They are from three to five inches long, soft and extremely flexible (more so than any other of the pines), and bluish-green in color. The new leaves are at first surrounded by a brownish sheath that is gradually shoved off as the growth continues. They reach their full size in August or September and remain on the tree for two, and sometimes three, years. The white pine is easily distinguishable from all others of its family by the much greater delicacy and softness, as well as the lighter shade of its foliage.

Both staminate and ovulate flowers are borne in cones on the same tree and appear in late May or June. The staminate cones appear in clusters at the base of the season's new growth. They are about one-third of an inch in length, oval and bright yellow at maturity, scattering their pollen at the slightest disburbance. The ovulate cones are borne either singly or in groups of two or three near the tip of the season's growth. They are pinkish-purple at first, oblong-oval in shape, and about one-half of an inch in length.

These occupy two years to ripen their seeds, becoming larger, long-stalked and pendant. During the first season they grow slowly and are not more than an inch long by winter. They are then nearly horizontal with the branch, slightly pendulous and light brown in color. In early spring they turn to a light green and commence to grow in earnest. During the second spring and summer they enlarge rapidly, become entirely pendulous, and, by the latter part of July, have attained their full size of from five to seven inches in length by about an inch in diameter in the middle, tapering to each end. During September or October the cones turn brown, the scales open and the seeds are discharged. The scales are from an inch to an inch and a quarter in length by about three-quarters of

an inch in breadth. They are thin, slightly thickened at the apex and are without the sharp tip that occurs on most other pine cones. Each scale conceals a reddish-brown, winged seed about one-quarter of an inch in length. The cones are frequently fairly well covered with the sticky, resi-

FRUIT OF WHITE PINE

nous sap of the tree. They fall during the autumn after discharging their seeds.

The bark of the trunk is dark gray and thick. It is divided by shallow fissures into broad, fairly continuous ridges or plates. That of the limbs is smooth and of a greenish-brown, while that of the branches is at first green, later turning to an orange-brown.

The preferred habitat of the white pine is rich, moist, well-drained soil, but it seems to thrive almost equally as well on sandy, gravelly sites. It is found from eastern Canada and Maine to Minnesota and south along the Alleghany Mountains to northern Georgia.

The white pine is, undoubtedly, the most valuable timber tree of our northern forests. Seventy-five or a hundred years ago the pine forests of Maine, Canada, New York, Pennsylvania, Michigan, Wisconsin and Minnesota were supposed to be practically inexhaustible. These immense forests, covering at that time almost endless miles, have been almost entirely cut away and, unless reforestation is started on a considerable scale without much further delay, the white pine, once our commonest tree, is in grave danger of becoming our rarest if not, indeed, entirely extinct. It is, however, a tree of strong vitality and reproduces itself freely under favorable conditions. New England, where attempts to cultivate it upon a considerable scale have proven successful, has shown that it can be done, and a little effort on the

WHITE PINE TRUNK

part of our conservationists may yet bring it back to something approaching its former glory.

It has been used largely, both in the United States and Europe, for decorative planting in parks and gardens and, at least in the North Atlantic States, no other conifer surpasses it in beauty, durability and rapidity of growth.

There is a saying in New England that no one

ever lived to see the stump of a white pine rot. Certain it is that the roots remain sound in the ground for a long time after the tree has been cut down. Where ground was to be cleared, fences were frequently made from the stumps of these trees pulled from the ground and stood in rows with their roots pointing upward. These fences occupied considerable ground and were cumbersome and awkward, but they had the virtue of being enduring and it was next to impossible for any living animal larger than a fox, or even a human being, to get through them.

Maine, when admitted to the Union in 1820, placed a figure of the white pine in the center of the design for her seal and arms. This was entirely fitting, as this tree was, undoubtedly, not only the finest product of the forests which covered by far the greater part of the state but far outnumbered all the other trees combined.

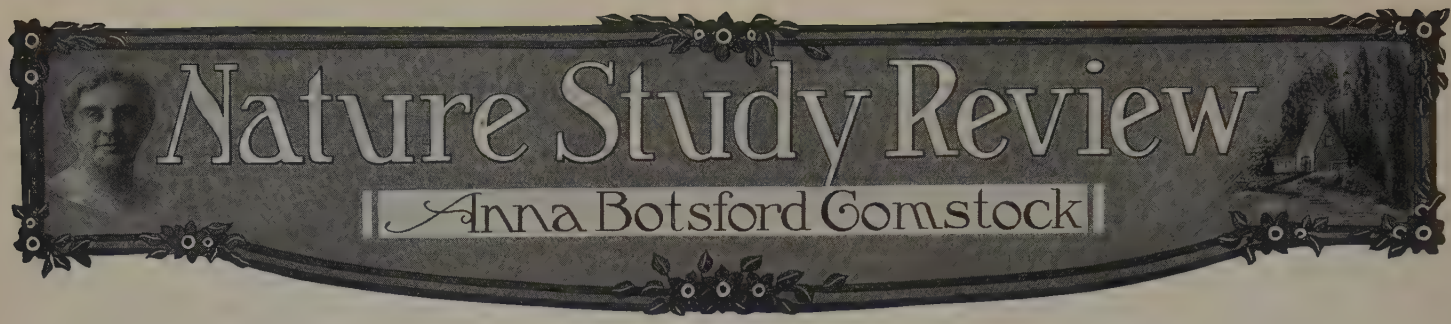
LEAVES OF WHITE PINE

The wood is light, soft, straight grained and easily worked, light brown with a slight tinge of red. It is used for a great variety of purposes where a soft, easily worked wood is desired, principally in the construction of buildings and the making of cheap furniture. The bark of the stems and roots contains tannin, not, however, in large quantities, and from the bark of the trunk is obtained the syrup of white pine which forms the base of many of our cough mixtures.

BLOSSOMS OF WHITE PINE

The white pine was introduced into England in 1715 by Viscount Weymouth and has since been grown extensively both in that country and over pretty much the greater part of Europe, where it is generally known by the name of Weymouth Pine. It is frequently also called by name in this country.

To those of us who passed their childhood in a country whose forests counted this tree as their crowning glory, no woodland sound can ever equal that of the breezes of spring, playing softly through the terminal branchlets of the lofty dark-stemmed white pines, telling of summer birds returning from the south; of crows and hawks even then patiently brooding on their nests near the forest roof, and of lesser feathered guests soon to hang their frail homes on the waving branches.



Pennsylvania's New Stand in Nature Study

By HERBERT J. STACK

PENNSYLVANIA is to give in the future a much more important place in its educational program to nature study. Without any question, during the last few years, but little attention has been paid to training teachers for teaching nature study in the elementary and secondary school grades. The teaching has been inefficient, occasional, and too spasmodic to be worth while. Teachers have been spending most of the entire day on the fundamental tools—reading, writing and arithmetic, with but little attention to the child's real, every-day experiences in the realm of the great out-of-doors. Yet if teachers are not to be trained in normal schools and colleges for teaching nature study, where are they going to learn how? And what course in the average university would you advise a prospective nature study teacher for the elementary school to take up? Of course, she can take Cryptogamic Botany, Zoology, Paleontology, Astronomy and a series of a dozen more specialized "ologies" common to the schools of higher education. But will the mere taking of these courses enable the teacher to bring the spirit of real nature study into the hearts of forty third-grade pupils? What we need is a plan whereby some forty thousand elementary school teachers in Pennsylvania and some hundreds of thouands of teachers in the country can bring home to the children the wonders and interests of nature.

If we could only train these teachers by bringing them up on a farm, as in the case of John Burroughs, Louis Agassiz, Edward Bigelow, Henry David Thoreau, Gilbert Trafton and a score of other leaders in the study of the great out-of-doors. Or if we could bring in some way the rich experiences of camping, country life, the woods and flowers to this great army of school people, our work would be easier. Or if they could sit at the feet of some of our great teachers and walk through the fields, camera and pocket microscope in hand. But such plans are quite out of the question for the great mass of our teachers.

The Pennsylvania Plan.—The new Pennsylvania plan calls for a complete twelve years of science in the public schools, eight years of which are to be largely devoted to nature study. The new state syllabus on nature study has been worked out, and copies will soon be available for Pennsylvania teachers. This will place before the teacher a completely organized plan whereby she can arrange her work just as she does in geography and history. This course of study has been planned with the following points in mind:

1. That the order of presenting topics will largely be determined by local conditions and materials.
2. That the children are to use the nature study as content or source of material for reading, writing, expression, drawing, etc.
3. That the work will deal with real living things as far as possible.
4. That regular excursions or field studies be made during the school term.
5. That the work planned be seasonable; that is, that the study being made shall correlate closely with the seasonable experiences.
6. That the study shall involve doing something, making something, or some other form of pupil activity fundamental in the teaching process.
7. That teachers will endeavor to teach the real appreciation of a few things rather than the identification of a great many. It is far more important to have the children appreciate and understand how a pine tree grows than to be able to identify *Pinus strobus* and *Pinus resinosa*.
8. As far as possible the work should be carried over into its real practical applications in gardening, planting trees and taking care of animals and birds. In this way the bearing of nature work on the every day life of the pupil is emphasized.

Nature Musings from a Car Window

By ANNA BOTSFORD COMSTOCK

IT GOES without saying that the "Nature-studyer" is sure to find more of interest in the change of scenes that meet the eyes of the traveler than is possible to one who has not learned to see what he looks at. To the former, every scene presents interesting phenomena, which challenge thought or invite future investigation. And yet it is a more or less futile effort to seek to share with others the mental riches that one thus accumulates with every changing mile. For instance, while passing the high plains and rolling lands and mountains of Colorado, how convey the interest and satisfaction experienced in the contemplation of Nature as a forester? The unending miles of low growth of pinon pine and juniper, so evenly spaced that it would seem as though the hand of man must have set them there, and yet Nature accomplished this so simply by limiting the amount of moisture. Each tree takes, from the soil around it, the precious water, leaving its environment so inhospitable to seedlings that, even though they sprout, they may not survive. Occasionally a Colorado yellow pine towers high above its lowly companions, and one wonders just how these large trees won their standing room. Though these three species of trees are all that can be seen for miles, yet, whenever a stream appears, it is ever fringed with cottonwoods, which at this time of year, with their pale trunks and masses of twigs, look like low fog banks marking the course of the river.

Photo by L. W. Brownell

PRAIRIE DOG

The little rascal has learned that the trains which pass are harmless.

The birds that frequent this region are a joy to behold, because the most common one is the mountain bluebird, which seems larger and lacks the red breast of the eastern species, but it is just as heavenly blue and inspires the same thrill of delight as it marks its undulating, azure path in the sunlight. Then there are flocks of swift, short-flighted birds that dart up here only to drop out of sight there. The Mexicans call them pinonettos, because they feed on the pinon seeds, but the species may not be determined from the car window, although a sure glimpse of dark tails, bordered narrowly with white, give one a hint that may lead to a study of bird books later on. However, the crows are the only birds one is sure of seeing at any time of day in these regions; only rarely a pair of hawks circle on moveless wings, hunting what? A Colorado hunter, who is a better shot than he is an ornithologist, told of shooting a hawk which, as it lay dying, disgorged a rattlesnake.

The animals, other than domesticated, are few that can be seen from the passing train. In regions under cultivation, the jackrabbit, grateful for the bounties of civilization, is fairly common. Often one rears itself questioningly, looking twice its real size, and then starts for cover at a pace the eye cannot follow. The sudden change from the upright position, with long ears erect, to the running position with ears laid flat along the back, is like the "Presto! change" of the magician. The only other animal commonly visible is that self-satisfied little rodent, the prairie dog. He is such a sociable fellow that, like the Indians of the region, he lives only in villages, and his pueblo consists of acres of conical mounds at spaces of a few yards. The little rascal has learned that trains are harmless, and so he sits upright on his tripod of hind legs and tail, holding his forefeet drooping affectedly, while he gazes at us with as much interest as we at him; or he may stretch out flat across his doorway, taking a sun bath and notes on our appearance simultaneously. Only rarely does one disappear, his hind feet twinkling in the air as he throws himself into his burrow

with a reckless haste, the more surprising because of his erstwhile indifference to our approach.

In all these Colorado regions, masses of tumbleweeds divert the attention; they are spherical plant ghosts of varying sizes, usually about as large as a half bushel; they roll gaily about the fields and eventually pile up against the boundary fences, and it is fun to watch the latest comer bounce over its fellows and ultimately roll over the top wire and start zestfully on a new journey to the leeward. How interesting it would be to investigate just how many seeds it sows for every rod it rolls!

As the train rushes on, the deserts of New Mexico replace the wildernesses of Colorado, and one's car-window meditations take a geological turn: why these abrupt changes in character and color of the soil? Here is a great barren level, with practically nothing growing upon it, and bordering it is an area covered with greasewood, sage brush, and a sparse growth of grass, as is evidenced by scattered herds of cattle and horses apparently grazing, though their food looks most indigestible and unappetizing to the easterner. Suddenly these all disappear, and a region of stunted pinon and juniper greets the eye. Now the soil glares red through the scattered vegetation, now brown, now yellowish-gray, seemingly without "rhyme or reason," and now it is black, marked by heaps of black blocks which we can see easily is lava, from some crater so ancient that no trace of it remains.

Photo by L. W. Brownell

WITCH GRASS OR TUMBLEWEED
(Eragrostis pectinacea)

The terminal flowering part becomes detached and is blown along by the wind.

Then bordering the desert as far as the eye can reach are great mesas, lifting their flat tops hundreds of feet above the plain, their sides buttressed with talus and worn by wind and water into strange columns and figures. Once the hard rock, probably of volcanic origin, that tops these mesas, was the floor of these regions. Geologists, always people of imagination and vision, have assured us that streams first broke through this layer and, later, water and wind by erosion have torn down the softer strata below, reducing these desert areas to their present level, leaving, for some mysterious reason, these mesas with their horizontal strata still standing, mute witnesses of the struggle of denudation in the immeasurably long past. How strange that streams which now meander through these deserts, making intricate curves and cutting deep gulleys with perpendicular seamed sides, should be descendants of those other mighty streams that tore down and carried away rocks hundreds of feet in height, and which covered thousands of square miles!

Just now, late in the afternoon, we are passing mesas of red rock that glow in the sunset light as brilliantly as clouds. Some of these mesas are symmetrical in shape and beautiful enough to be the carved monuments holding the sarcophagi of ancient kings. One seems a cathedral with Gothic roof and great carved doors, and still another, a coliseum in form. We gaze entranced as the sunset light fades, and a few straggling crows, the only living creatures in sight, wing their way wearily towards those far mysterious desert realms, where knowledge ends and dreams begin.

A School Bird Club

By M. G. MASSON

AS UNCLE REMUS would say, the children of the Ketcham School and the birds are "in cahoots" with one another, and it has come about through our mutual friends, the holly, the cedar, and the apple tree, not to mention the clump of lilacs down by the hedge. For how is one to help having bird neighbors if he lives next to a holly tree that displays an inviting dessert of red berries from October until April, and who associates daily with an enchanted cedar and an old apple tree that boasts all sorts of cozy hollows? As to the tangle of lilacs—they advertise the most delightful inducements to prospective nest builders. Of course mere people cannot hope to offer such attractions as these, but we are trying our limited best to live up to them—hence our bird club.

The Ketcham School has always had a bird club; no one could expect to live in surroundings like ours and not advertise the fact. The present club is just an outgrowth of another that was formed some years before. Our club inherited the mantle of the old one last year though it moved into new quarters on the other side of the building, and if the mantle has had to have new breadths added since, it is because of the cedar tree.

A BIRD STUDY CLASS

The diagram of a bird on a blackboard is a wonderful aid to study.

For the cedar is not an ordinary kind of a tree. It possesses a magic; maybe it is a singing magic, for it attracts birds, whole flocks of them, to rest in its branches. The first ones last spring were the cedar waxwings that lodged in the cedar and dined in the holly tree. We used to speak of Cedar Tavern and Holly Tree Inn. Then came the goldfinches, a noisy crew that chattered and gossiped as they ate the blossoms of the elms nearby. The next patrons of the tavern were the purple finches. After that there were just day guests, but they were very pleasant company while they stayed: robins, a thrasher or two, bluejays, grackles, catbirds, vireos, warblers—all were duly entered in the tavern guest book.

However, the cedar tree is really in the middle of the story. We did not discover it until spring, and our club was formed in the fall and established, as the constitution committee has set forth in that document, "on the seventeenth day of November, in the year of Our Lord, nineteen hundred and twenty-two." We had read of Theodore Roosevelt's bird club at Oyster Bay and of the chain of clubs that grew out of it. The idea appealed to us, so by general consent we chose our name—The Theodore Roosevelt Bird Club.

Our aim, as adopted in the constitution, was "in every way to encourage birds to come to our neighborhood and to try to prevent their destruction." To that end bird houses and feeding boxes have been installed and pieces of suet tied to the neighborhood trees, and a campaign committee has been authorized to make and distribute posters setting forth the advantages to be had from the encouragement of birds. Last year one boy took a poster to a farming neighborhood in the country and had it put up in the general store. On it he had listed birds of special use to the farmer.

We have a library committee whose duty it is to collect bird literature and to write for bulletins. A child is appointed to care for the bird skins which are growing into a very worthy collection, although there is such a thorough inquest held over every specimen brought in that it takes real courage to face the court.

We keep charts of birds we have seen, the date of their appearance and their food habits, and we compare our list with the list of birds scheduled to appear in our locality. It is surprising how long the list is.

Toward spring we make a more intensive study of birds in preparation for our walks in April and May. Last year about twenty of us attended the Junior Audubon bird classes, and at least half the class took the test at the end of the course. All

(Continued on page 317)

The Teacher and Nature Study

By ALVIN M. PETERSON

A PERSON does not need to spend very much time in the woods, fields, and pastures without discovering the fact that the only interest many people have in nature is the interest of destruction. They shoot song birds and wild game and pick and destroy wild flowers. They do not hear and enjoy the songs of birds nor enjoy seeing a soaring hawk. They see nothing to admire about the blue jay or the red-headed woodpecker. Some of them enjoy seeing and finding about them. The indifference on the part of pupils is due to indifference on the part of teachers and parents. Very rarely one finds a teacher that is enthusiastic about nature study rather than the reverse. The enthusiastic teacher practically always has enthusiastic pupils and at that as enthusiastic as herself. Many teachers teaching nature study and biology are interested enough in birds, flowers, insects and trees, but evidently interested in them only when in the schoolroom. It

MONARCH BUTTERFLY

It is beside the chrysalis from which it has emerged. Note the difference in size.

TWIG FROM THE CHOKE CHERRY

This is a gem during the flowering season and always attracts attention.

our pretty wild flowers and then thoughtlessly pick them in large numbers, thus aiding in their extermination. We are told that conditions are improving, but there is still an immense amount of work to be done by those interested in nature and the conservation of natural beauty.

A very large proportion of the pupils in our schools are passing through them without learning much about, and acquiring a love for, nature. Most of them are indifferent to the beauties and wonders

A NATURAL BEAUTY SPOT

Here are to be seen Mandrakes, large flowering Trilliums, and yellow violets.

is no uncommon thing to find teachers teaching nature study that never take a trip to the woods and fields. Still they hope to arouse the interest of the pupils in the subject.

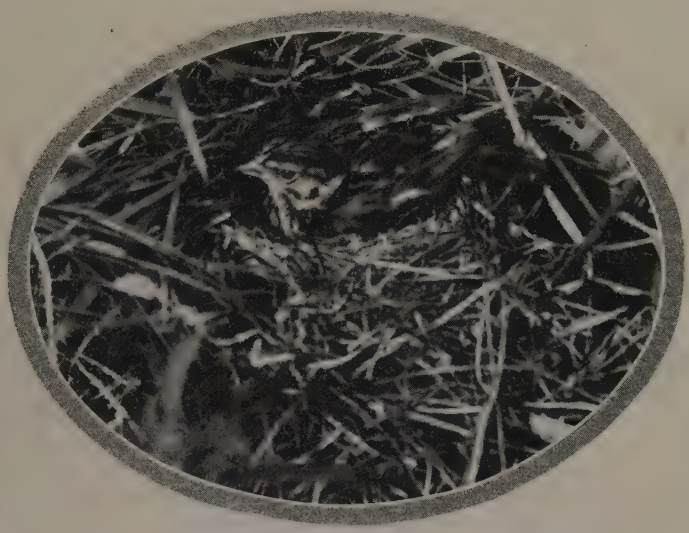
The indifferent pupil is not to blame for his indifference except in a few exceptional cases. His indifference is due to indifference on the part of his teacher or teachers. But the indifferent teacher is really but little more to blame than the pupil. Teachers are not interested in nature study because our normal

schools and colleges are not sufficiently interested in it. The teachers of teachers are indifferent, and hence their teacher-pupils are indifferent. Enthusiastic normal school and college teachers turn out enthusiastic grade and high school teachers. The remedy for existing conditions lies in securing, as far as possible, real nature study teachers for normal schools and colleges, in enlisting the interest of the administrators of such schools in the work, and in making nature study a required subject for all persons expecting to teach.

I realize that some will say, if you require all to take nature study, that the subject will to that extent be made formal. But I realize, too, that we have not gotten very far under the present elective, hit or miss system as regards nature study. I believe that at present the best way to increase the number of teachers interested in nature study is to require that all take it. Make it necessary for all persons expecting to teach to take nature study because all will be required to teach it as the subject has been made a regular part of our grade and high school courses. At the present time reading, writing, arithmetic, language, spelling, and geography are required subjects that most grade teachers are called upon to teach. Consequently they make a study of these subjects and how to teach them. Every teacher, too, because of this fact, is more or less interested in them but not in nature study. Today, most teachers do not need to teach nature study, do not make a study of it, and are not interested in it.

A SLEEPY NIGHT HAWK

Acquaint children with birds and they will soon love to study them.



VESPER SPARROW BROODING

Note how the color and marking of the bird blend with its surroundings and aid to protect it.

A BUSY DAY AT THE BIRD BATH

These baths fascinate the children and are a comfort and delight for the birds.

A teacher cannot be expected to like and be enthusiastic over a subject she knows but little about. The surest way of learning to like a school subject is to make a study of it. The pupil who likes algebra is the pupil who has made a careful study of it and learned considerable about it. The boy or girl who is interested in geometry is the boy or girl who has worked hard and learned considerable about geometry. The men most interested in forestry are men who have made a careful study of it and are indeed authorities on the subject. The boy who has never seen a radio set and knows nothing about it is not interested in radio. But the boy who has a set and has studied radio—how interested and enthusiastic he becomes.

Apply this to nature study. School children are indifferent to the birds, insects, flowers, animals and trees about them because they know but little about them, which in turn is due to a like condition as regards their teachers. As soon as we have a teaching force

well grounded in nature study, we will have a body of teachers interested and enthusiastic about teaching it, and in turn have pupils that are interested and enthusiastic about it. Such pupils will have far more powerful interests than the interest of destruction. Teachers insist on teaching subjects of which they have made a careful study and in which they are, as a consequence, interested. Any teacher will tell you that she likes to teach what she knows well.

T. Gilbert Pearson in his book, "The Bird Study Book," shows how quickly teachers respond to instruction in nature study when led by an able and enthusiastic instructor. I refer to the account of his work at the University of Tennessee as related in Chapter 12. No doubt, most of the twenty-five teachers there mentioned went back to their respective schools and devoted considerable time to teaching nature study. Most of them, too, shortly, taught pupils that were far from indifferent as regards nature study. The pupils became interested because their teachers were interested, and the teachers were interested because the school they attended during the summer was not indifferent to the need for such instruction.

Chester W. Smith in his charming little book, "A Summer of Saturdays," shows how quickly pupils respond when they have the right sort of teachers, teachers who love nature and like to teach what they can about its wonders and beauties. The book gives us an excellent picture of a wonderful boy, the product of a wonderful teacher. Perhaps I should say that he was a wonderful boy, the product of wonderful parents aided by a wonderful teacher. Hasten the day when every community has a large number of just such boys. Our wild life will then be safe from the forces now threatening its destruction.

Natural Science and Nature Study in the Schools

THE FOLLOWING is the course of nature study advised by the Department of Applied Education of the General Federation of Women's Clubs, for Grade Five.

It can readily be adopted by a mother as a course in nature study for her children, or can be made the basis for study by any lover of nature.

GRADE FIVE

Gardens:

Clean up garden plot.

Dig in manure and plant green fertilizer.

Grow fuchsias and carnations from cuttings for the window boxes.

Grow tomatoes, cabbages, asters and verbenas in shallow boxes to have plants ready for sale and to set out in the spring.

See directions for the project.

Grow tomatoes, cabbages, asters or verbenas for profit. In this project let each pupil grow one vegetable or flower and become expert in handling it. Have pupils secure information from government bulletins, books in library and other sources and apply it. Young plants as well as the mature products may be sold. Have each pupil keep accurate account of all expenses including his own time and of all income so as to show his profit at the end of the project.

Pets and Domestic Animals:

Comparative habits of dog, cat, squirrel, cow, horse, pigs.

Comparative structures of common animals.

Offensive and defensive structures.

Protective color, alluring color, etc.

The senses of common animals, the part they play in defense and offense.

Experiments to determine sensory keenness.

Toys and Home Appliances:

Make and fly ordinary kites, also box and bow kites. Why do kites fly? Experiments to show composition of forces. Why box and bow kites need no tail.

Make and sail boats.

Make windmills and hitch them up to do work like turning a flywheel.

Make an aeroplane.

Make waterwheels that will operate under the water faucet or pump.

Make and send up a hot air balloon.

Make and operate the tin can telephone.

Correlated Materials:

Learn common fall flowers and weeds: Amaranth, beggartick, bindweed, bouncing Betty, buffalo bur, burdock, butter-and-eggs, butterfly weed, catnip, cheeseweed, groundcherry, chickweed, cinquefoil, cocklebur, daisy burdock, yellow dock, dogbane, evening primrose, everlasting, fleabane, goldenrod, barnyard, crab, foxtail, old witch and squirrel tail grasses, hounds' tongue, Jimson weed, knotweed, lambs' quarters, milkweed, mullein, peppergrass, plantain, pokeweed, purslane, ragweed, ribwort, shepherd's purse, sheep sorrel, milk spurge, sunflower, bull and Canada thistle, vervain, yarrow, asters and goldenrods.

Study of a typical plant like bouncing Betty, methods of propagation, seed dispersal, rate of reproduction.

Soils and their formation.

Kinds of soils.

Experiments on absorbtion of water.

Add to your collection of rocks and minerals.

Learn more wild flowers and some of the common ferns. Wild carrot, cow parsnip, poison and water hemlock, golden old man, golden ragwort, green dragon, ginger, ginseng, Jack-in-the-pulpit, painted cup, puccoon, some of the sedges, spikenard, spiderwort, waterleaf. Bracken, Clayton's, cinnamon, maidenhair, ostrich, royal, sensitive ferns. Learn to know the poisonous plants, especially poison ivy and poison sumac.

A Hunting-Wasp and Her Prey

By ERNEST KEIL

READING the vivid and masterful description of the Hunting-Wasps by the great naturalist J. Henri Fabre gave me a thrill that was only surpassed when, on a hot summer day, I had the good fortune to surprise one of the confidants of the immortal Frenchman on our homegrounds.

The huntress, pictured here, was discovered in

HUNTING-WASP AND VICTIM

the act of carrying a paralyzed victim of her chase toward the underground cradle she had provided for her offspring. Digging the tunnel and stocking it with the necessary rations of fresh meat consumed all the time from daybreak until nearly five o'clock in the afternoon, most of this time being required for hunting.

After the winged savage had completed her work she was captured and her dwelling breached. It consisted of a tunnel, dug in the soil of a flower box, about three inches deep, ending in a roomy gallery where three paralyzed victims were stored side by side. One of them had the egg of the wasp fastened across its legs.

HOW THE LION YAWNS

1st, The first gentle movement.
2nd, No stopping it now.
3rd, The half way station.
4th, The limit is reached.

NATURE NEWS AND VIEWS

On the Side of the Crow

Acting on the principle that the crow is the farmer's enemy, the Du Pont Powder people have established an international crow shooting contest in this country and Canada. Crows undoubtedly do occasionally injure growing crops. They also, from time to time, destroy the eggs of other birds. On the other hand, the crow does a great deal of good by destroying mice and other rodents, and harmful insects. It is not difficult to protect the early crops against crows, and it may be a serious mistake to start in destroying birds without thorough knowledge as to whether they are friend or foe.

The lover of nature may well look with suspicion on any widespread movement involving the destruction of large numbers of our birds or mammals which is fostered by a group of men seeking financial gain. In the case of the crow, an exhaustive study of its food habits has led to the conclusion that, while some protective measures, or the destruction of individuals, are often necessary, indiscriminate killing of the birds is not warranted.

The Horns of the Antelope

It is said that no man has ever seen an antelope without a full set of horns, and yet we know that the antelope does shed them. The fact is that the horns of the deer break off at what is known as the burr, while the antelope sheds the old shell only to discover a new horn beneath. The growth of the new horn, which is covered with stiff bristly hair, evidently gives rise to some irritation beneath the old horn and causes the antelope to keep rubbing it on the rocks or bushes. In the course of a month or six weeks, the old shell slips off, leaving a horn which, though tender at first, is fully developed.

Tornadoes in New England

Readers of Nature Magazine assures us that there have been tornadoes in New England, as well as in the central states, and have written to describe a definite funnel-shaped cloud, not so slender and tall as those of the photographs in Nature Magazine for March. This tornado cloud was seen by a number of witnesses near South Norfolk, Connecticut. It destroyed one house completely and did other violent damage such as only a tornado could perform.

A New Building Material

A company has recently been organized to make a new building material similar to concrete but which is really a combination of Portland cement and mineralized sawdust. It is claimed to be cheaper, stronger, and in nearly every way better than real concrete. This represents one of the many answers to the problem of saving forest waste and thereby lessening forest destruction.

A Giant Chestnut Tree

One of our readers writes us of a gigantic chestnut tree standing in Anne Arundel County, Maryland, some five miles from Annapolis. By actual measurement this tree is 25 feet 2 inches in circumference. Like nearly all our chestnut trees, however, it has succumbed to the chestnut blight and probably will not stand many more years. Trees belonging to the original virgin forest of the eastern states are always interesting curiosities, for there are so few of them left.

Shrikes vs. Bluejays

It is said that shrikes sometimes attack bluejays, but one of our readers tells of how a shrike came to a feeding table this winter where eight bluejays were all eating. The shrike lighted on a branch a little above the jays. They looked at him one instant and then, by apparent mutual agreement, all started for him at once. The jays kept hot on his trail until the shrike took flight, and they all trailed after, each one screaming his loudest until the sound of battle faded in the distance.

Will This Refuge Be Restored?

As was recently pointed out in the pages of Nature Magazine by Mr. Finley, the draining of one of the largest and finest of California's lakes, the Lower Klamath, left but an alkali lake bed, unsuitable for agriculture, and destroyed the former home of great quantities of wild birds. Even the residents of the region, many of whom formerly favored the drainage project, now see that this lake was a more important attraction to the country than the poor agricultural land made available through its drainage. They now see that a great outdoor resort, attractive to thousands of people, was exchanged for a few acres of grain, mostly poor at that. The California Fish and Game Commission is now putting forward the demand of sportsmen and conservationists throughout the state for the reflooding of this area and the reestablishment of this great natural bird reservation. If enough friends of wild game demand their rights, there is a chance to regain what has been lost.

New Joys in the Yosemite

The management of the Yosemite National Park is arranging for hikers' camps to be located in the wild back country so that it will not be necessary for the real nature lover to follow the beaten paths made commonplace by the tread of throngs of sightseers. The new camps will be located on the most beautiful of Sierra trails and situated in spots near the greatest natural wonders—wonders undreamed of by the tourist, who believes he has seen Yosemite when he but visits the valley and its adjacent rim.

Will a Seed Raise an Orange?

The author of the article on orange growing which appeared in the February number of Nature Magazine received a number of inquiries as to why he made the statement that all orange trees are budded, and the inquiry has been repeated as to whether an orange plant will not bear fruit unless grafted. An orange tree grown from seed will produce fruit, but since none of the fruits come true to the variety from seed, there is no means of determining what sort of fruit will result until the time for bearing comes. The product of the great majority of seedling trees is undesirable with respect to size and quality, therefore budding to a known variety is practically the only safe method.

Franklin Moon Honored

Professor Franklin Moon, Dean of the New York State College of Forestry at Syracuse University, has accepted the invitation of Secretary of Agriculture Wallace to serve on the Advisory Council of the Northeastern Experiment Station of the Department and the Forest Service at Amherst, Mass. The appointment will bring to the service of the country the facilities of the New York State College of Forestry.

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Or perhaps you will want to read about the mysterious world of these fairy visitors—the butterflies—their distant migrations—their defensive weapons—their brave struggles. How some of these wisps follow the birds south when the snow flies. How most of those fragile creatures stay and endure the savage cold of winter.

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Artificial Reforestation

Raphael Zon, director of the Lake States Forest Experiment Station maintained by the United States Forest Service, declared in a recent interview in Washington that one of the major forestry problems in the lake states is the artificial reforestation of about twenty million acres of waste land in the Lake States region alone that once supported forests. Nature can handle gigantic experiments, but when man realizes that because of his destructive policy in the past he must undertake a huge proposition of this kind, he finds it a long and expensive task, and he begins to appreciate what tremendous damage one forest fire can do.

Refuges for Migatory Birds

Nature lovers and naturalists are active in supporting the Anthony-Brookhart Migratory Game Bird bill pending in Congress. The bill provides that the Federal Government shall establish refuges for game birds and shooting preserves open to hunters in the open season upon payment of a license fee of one dollar. The measure also would supplement the agreement with Canada for reciprocity in the protection of the wild life of the two countries. At a recent hearing on the bill, Dr. E. W. Nelson, Chief of the Federal Bureau of Biological Survey, told the Committee on Agriculture that the migratory birds of the United States would be extinct unless refuges were provided and hunters supervised. W. P. Hornaday, Director of the Bronx Zoo in New York, also supported the measure.

Grove of Redwoods Saved

Announcement has just been made by Dr. John C. Merriam, President of the Carnegie Institution of Washington, and head of the Save the Redwoods League, that through the generosity of a resident of Massachusetts another splendid grove of California Redwoods, or Sequoia sempervirens, has been preserved. The tract is in the heart of the Humboldt State Redwood Park about 45 miles south of Eureka, Calif. It comprises 113 acres and contains some of the largest Redwood trees of this region, many of these giants being from 10 to 15 feet in diameter and from 200 to 300 feet in height. There are several ideal camping spots in this grove, which is located on the banks of the South Fork of the Eel River. The citizen who furnished the funds that made possible the saving of this grove refused to have his identity made known, asking that he be designated simply as "a resident of Massachusetts." After purchasing this tract the Save the Redwoods League immediately deeded it to the state of California to be held for all time as a public park.

The Swallows

"Here you have a short description of four swallows we have seen this afternoon," said Gray Lady, as Tommy came to the end of the board and only finished by squeezing up the letters. "There is another swallow, the big cousin of these, called the Purple Martin, with shiny bluish black cloak and light underparts," says Mabel Osgood Wright in her book, "Gray Lady and the Birds," published by Macmillan. "This beautiful Martin has a soft, musical voice, and is very sociable and affectionate, and even in spring, when the birds have mated, they still like to live in colonies and are very good neighbors among themselves. They were once plentiful and nested in tree holes or houses made purposely for them, but, since the English sparrow has come, it has pushed its way into their homes and turned them out, so now they are rare, and perhaps you children may never have seen one."

The Tiger's Eyesight

"The eyesight of the tiger is remarkably good," says A. A. Dunbar Brander in his book "Wild Animals in Central India," published by Edward Arnold and Co., "and it is on this sense and hearing that he depends. They nearly always detect the slightest movement, but unless they look directly at one may fail to pick one out from the surroundings provided one remains motionless. Their powers of vision are therefore very much less than the peacock's. They possess great self control, however, and on suddenly catching sight of one need not disclose that they have done so, which deer and most animals invariably do. I have known tigers come slowly out in a beat and, suddenly becoming aware of the sportsman, continue to come slowly on until they reached dead ground and then break back. No deer has this self-possession, and they would always make it evident that the sportsman had been seen.

"With regard to the sense of smell, they hardly possess any, and what little they do posses they seldom use. Animals develop this sense either to hunt game, get their food, or for self-protection. None of these causations apply to the tiger. They find their game by their ears and eyes, and having stalked it they rush upon it. They do not run things down like wild dogs. They have been 'top dog' in the country they inhabit for so long, their strength and ferocity have been all the protection they required. If they possessed even reasonable powers of scent, it would often be impossible to drive them up to guns under the circumstances commonly in vogue."

Lignite—A Future Fuel

(Continued from page 273)

than North and South Dakota combined, and barely more than the state of North Dakota alone. There are single counties in North Dakota which probably have as much unmined coal as the total estimated in France. The comparison between the use that Europe makes of its resources and the neglect that we in America display is interesting, though discouraging.

As it dawns upon the people of the northwest that they have sufficient latent heat and power to run all the transcontinental railroads between Chicago and the Pacific, there is increasing faith in the future of this section. Little by little the conception is growing that the future of the Dakotas will be one of industrial development rather than a community based on agriculture alone.

When the coal of the prairies comes into its own, fuel famines in the northwest will be unknown, and the prosperity of industries based on known and constant price, quantity and quality of fuel will be assured for centuries to come.

The northwest has gradually been awakening to this situation. Realizing the trend, the United States Bureau of Mines about two years ago attacked the problem of devising a process that would take the moisture and gases, known as volatile matter, out of lignite. The process has passed beyond the experimental stage. An oven has been devised that will produce a fuel known as "Lignite Char." It is now being extensively tested in the North Dakota fields. Two tons of lignite passed through this oven will come out as slightly more than one ton of this fuel.

Here we come to nothing less than an economic romance. Can you imagine receiving, instead of the ton of anthracite you pay dearly for, a ton of excellent smokeless coal, enough gas to run your cookstove for a month, enough motor fuel to run your flivver 40 miles, enough fertilizer to start a sizable garden patch and enough tar to lay the dust on the road in front of your house—all for less money than the anthracite would cost you? Probably you cannot imagine it, but that is no exaggeration of the possibilities of lignite. You want proof? Very well.

First you must get the lignite out of the ground. This is done either by steam shovels on a surface or "strip" mine, or it is taken out of the earth from seams below the surface ranging from eight to twenty feet in depth. It is taken out by the same methods used in our present coal mines. Brought to the surface, this lignite contains a lot of volatile matter, including water. Transporting the water by railroad would be foolish. Instead we will carbonize it.

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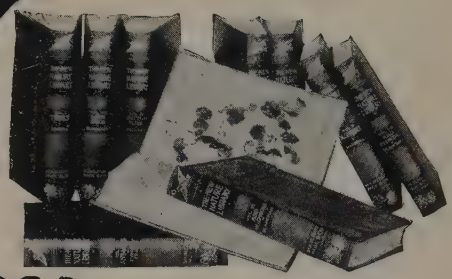

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Have you discovered the many curious and amazing forms of life to be found in any tree? Do you know that as many as a hundred different species of insects often exist in a single oak, all of them busy with their own particular occupations, from spinners and weavers, paper-markers and engineers, to burglars and highwaymen?

To those who know the secrets of Nature, nothing is so delightful as to spend leisure hours in park or country in quest of new wonders. That is why men like Theodore Roosevelt, Thomas A. Edison, and John Burroughs have found such keen pleasure in the out-of-doors.

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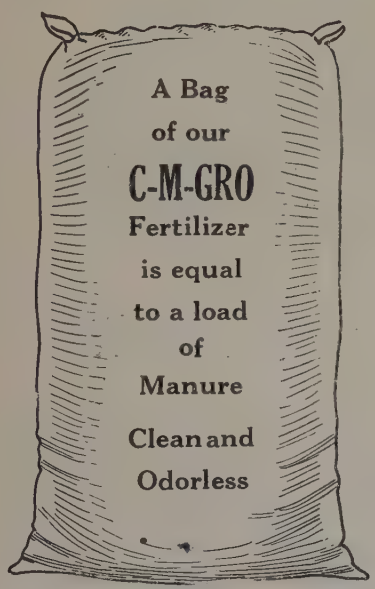

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We find that lignite is willing to part with its volatile matters easily. This simplifies the process, and these materials are taken away. The lignite crumbles into a fuel entirely comparable with anthracite screenings. It is well adapted to being made into briquets. These usually egg-shaped pieces of coal, made by binding and pressing, boast an unexcelled heating value for domestic and commercial use.

Don't forget, however, that the volatile matters haven't been allowed to escape up the chimney. They are too valuable for that. One ton of lignite yields more than 10,000 cubic feet of gas. Perhaps one-half of this has been used up in doing the carbonizing, but the other half is left. It costs nothing. If you will remember that last gas bill in the pigeonhole of your desk, it assessed you more than one dollar for every thousand cubic feet you used.

Now the future of gas appears to rest on its use for heating. The future of lignite rests on its being carbonized. The gas produced in the carbonizing process has a high heating value. It can be enriched, if necessary, by petroleum oils obtained as well from the lignite. Ergo. Both are necessary to each other, and to us.

We will not stop here, however. Ammonia is contained in the gas and gas water. It may be taken out in the form of ammonium sulphate, a valuable fertilizer. Equally well, it may be used for refrigeration or for the manufacture of nitrogen products, necessary for explosives.

Having enriched ourselves to this extent from the lignite, we still have oils and tars left. By simple distillation oils can be made into fuel oils for furnaces and automobile engines. They can be made into oils for the preservation of timber, leather, cotton and other fabrics. Pitch, perhaps, makes the best binder for the lignite briquets, reducing the cost of this process without calling on any outside aid.

Greater distillation of the remaining products will produce benzol, aniline dyes, chemical for your photographic work, coloring materials, valuable acids and even perfumes. In fact, there is a host of possible uses that can be developed as a result of study of processes and needs.

We are using up our petroleum resources with great rapidity. We are wasting as we use them. But they are not endless, while the demand upon them is increasing. More than one-half of our original supply has gone, but our economic life depends upon it. Imagine then, if Texas lignite can be used in the way that is possible. Great quantities of petroleum and natural gas would be released from their present pressure.

There is another consideration. These deposits of lignite lie in parts of the country where agriculture is the major pursuit, In these sections no other deposits of solid

fuel are to be found. Indisputably there is romance in the thought that lignite, taken from the soil under the farm, can be set to work heating the farmhouse with coal, preserving the barn from rain and snow, and running the tractor that tills the soil on the surface.

In Alaska the United States has a great and valuable territory. It is rich in natural resources, rich beyond measure. To get these resources out to the world there must be railroads, and railroads must have fuel to run them. Here enter the Alaskan deposits of lignite in their full importance.

The late Charles P. Steinmetz estimated that the maximum possible energy from hydroelectric development in the United States would be 230,000,000 kilowatts. This would mean using everything from river to rivulet. He pointed out that this is little more than the energy now derived from coal. It equals the present total energy consumption of the country.

"This is rather startling," Mr. Steinmetz declared. "It means that the hope that when coal once begins to fail we may use the water powers of the country as a source of energy is and must remain a dream, for if today all the potential water power of the country were developed and every drop used it would not supply our present energy demand."

Thus does the importance of the maximum use of coal stand out in its true light. In the light of this future condition, lignite, so long despised but so wisely given us by Nature, takes on a new significance. It would seem as though Nature had foreseen the prodigality and frailty of man in handling the gifts made to him and had wisely left him a way to retrieve himself.

Color of Animals

"One of the most conspicuous of the external characters of vertebrates, as well as of other animals, and consequently important in the classification of them, is their coloration," says Henry Sherring Pratt in his "Manual of the Vertebrates of the United States," published by P. Blakiston's Son & Co. "This is also a feature of great importance to the animal itself in its relation to its environment, inasmuch as in a large class of cases the coloration of an animal tends to render it inconspicuous to its enemies and to its prey, and perhaps to increase the absorption of heat from the atmosphere or to prevent the too great radiation of bodily heat to it. The same color pattern, however, in numerous cases does not characterize all the individuals of a species, the males being often colored differently from the females and the young individuals from the adults. The summer coat is also often different from the winter coat in color and markings. The practical purpose of these differences is sometimes hard to explain, but can often be correlated with the habits of animals and the need

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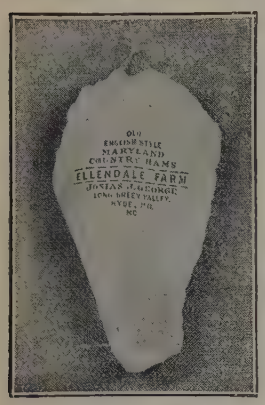

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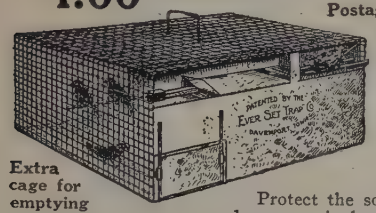

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Protection from Marine Borers

"On the sea coast, piling and dock timbers are often destroyed by marine borers, even more quickly than timber on land is destroyed by decay," says R. S. Kellogg in his book, "Lumber and Its Uses," published by U. P. C. Book Co., Inc. "The annual loss from this source is very great. In fact, in many places it is almost impossible to use wooden piles unless they are protected from borers. The best method of giving such protection is to apply a pressure creosote treatment, since creosote is as distasteful to marine borers as it is to decay-producing fungi. Well-creosoted yellow pine piles have been known to give thirty years or more of service in situations where, if unprotected, they would have been destroyed in a single year."

The Breaking of a Buffalo Team

(Continued from page 270)

a wonder. It was broken to the sulky and had a great reputation for speed. If I would race one of the buffaloes against that steer, he would take me up. Of course I agreed. I selected War Whoop for this test, and I hitched him to a sulky. The steer was hitched to another and we trotted out on the track. As we came down toward the grand stand we "got the word," the buffalo jumped clean out in front, and the steer never saw anything but his tail after that. We won by a quarter of a mile on a half-mile track.

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The Seven Ages of Trout

(Continued from page 288)

to them. There is one chance in a thousand that under cover of darkness you may snare him if you know the exact situation where he lies and have patience to wait, then you may succeed with a well-played live or artificial minnow, but the chances are all in his favor of getting free, by a terrific surge of his ponderous bulk, so experienced is he in hook evasion. Fully immune is he from capture, living a merry and happy life mid peace and plenty.

The sixth age ushers in the weakening grandeur of advancing age, whereby gross indulgence pays the penalty. For some cause or other the appetite wanes. Hungry desire no longer tempts him to move from the dark, deep hole he has chosen; lying still the vast bulk begins to dwindle away, the sides shrink to shabbiness and parasites attach themselves to the skin, once so sleek and shiny. Neighbors that used to be so deferential now pause as they pass by to look on and snicker with surprise at the fast-dwindling form. The younger, and now more bold, nudge each other, point their fins at the painful evidence of past glory—the change from a barrel to a mere stave.

The neighbors' frequent jeers and jibe at his lean, skinny condition at last become so unbearable he decided to move from his two seasons' lair and become a wanderer from pool to pool. His lank appearance excited the same surprise and derision no matter where he rested; then, in sheer desperation, he conceived the idea he would try to fatten up again, at least to a decent normal proportion.

So he darted after a big floating grasshopper, only to find it barbed at the end of a fisherman's line. With some of his old-time vigor he dashed off in a furious rage, his long lithe body, propelled with the broad powerful tail, cleaved the water at such a pace as to force the angler to run away up stream where he gradually reeled in, only to find at the very edge of the net the great prize escaped and got away.

Last scene of all finds the pantaloon at the foot of a great falls where no angler would imagine a trout would choose to haunt. Under shelving rocks far beneath the boiling water there he lies, solitary and still—day after day, week after week, without friends, without food, a self-imposed prisoner in semidarkness and gloom.

It is lovely springtime, the river is teeming with life and movement, the air is filled with insects sailing up and down, dropping their eggs on the rippling surface of the water. He sees or knows none of it—his fins and tail are still, and like a floating log he lies void of life, except that his great, hooked lower jaw moves up and down a wee bit taking in a pitiful remnant of the breath of life. His eyes are lustless and dim, and the colorless leathery skin has patches of painful sores made by the parasites that attack inactive bodies.

Heavy rains now flood the river—helpless and weak, his tail and fins have no power to battle against the strong undertow and he is swept along on his side once again into rapid water from his self-chosen watery tomb. Away far down the river is a little boy, holding a willow wand; attached to it

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is a line and hook baited with a small wriggling worm, fishing without any success for baby trout. The sharp-eyed boy perceives a strange floating object coming down stream; a moment later, the great monster trout with white belly skyward is cast ashore right at his very feet.

The School Bird Club

(Continued from page 303)

but two of these children got their certificates, and one of the two recognized thirty-five out of fifty birds.

Last year, our bird walks did not begin until after Easter, but we are planning some earlier excursions this spring. Some of them we make in the class nature time and others after school. It is interesting later on to remember the various nests and watch them. At one time last year we had those of a cardinal, two mourning doves, a bluejay, a crow, a brown thrasher, and a songsparrow. As they were in different parts of the wood, it was quite a feat to record developments in all of them.

The Roosevelt Bird Club has outgrown the seventh grade room where it had its beginning. It is not just a class club now but includes all the upper grades of the school and aspires toward a junior branch. Its meetings are held every three weeks in the school assembly hall, where we can have a more pretentious program and the presiding officer can hold forth from a real platform. That platform inspired one of the eight grade girls to write a bird play, which was presented at a meeting early in December. If we charter members recall more intimate discussions in the old room, which are hardly possible now with our larger organization, we try to forget them in the eighth grade girls to write a bird play, on. And it *is* a good thing, for when we learn to know the birds we are not only forming a very delightful friendship but we are opening the way to all kinds of happy discoveries and good times out of doors. We offer the birds our friendship and protection, and they repay us a hundredfold.

Red Giants and Gold Dollars

During the past year two large tracts of Redwoods were set aside and three funds were made available for the purchase of additional tracts, according to the annual report of the "Save the Redwoods League" of California. There is a peculiar fitness in one of the funds contributed by a resident of Massachusetts who loves the red giants of the Golden State to the extent of $25,000. The California Federation of Women's Clubs voted a fund of $60,000 for a memorial redwood grove, and Mr. E. E. Ayer, of Chicago, made a fund of $25,000 avaliable. A banner year!

A Book on Birds

Bird lovers throughout Massachusetts are one in support of a bill before the State Legislature advancing $12,500 for the publication of a volume on the birds of the state. The manuscript has been completed after two years work by Edward H. Forbush, state ornithologist, and most of the illustrations have been made. The efficiency department of the Commonwealth looks somewhat askance at the plan, but a similar and more restricted volume published two decades ago and sold by the state is now in the class of rare books. It is to be hoped that the project will be carried through.

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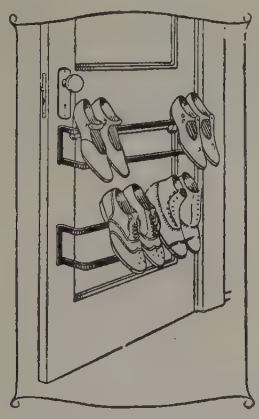

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Nature and Human Nature

(Continued from page 280)

of all boys between 8 and 18. At that age, they care little what the teacher or the preacher thinks of them, but they do care what their gang thinks. The hardest punishment any boy can receive is expulsion from the gang. "The fellers won't let me play with them" is the cry of a broken heart. And the crime for which it usually is meted out is "peaching," that is, treachery to the gang.

Similar power and possibilities are found in the instinct of initiation, the habit of giving nicknames, the love of personal decoration, the propensity to carve one's name in public places, the craze to make collections of stamps, shells, specimens, etc., the compulsion of atmosphere, the power of little ceremonies, the love of romance, the magic of the camp-fire.

All of these and many more are considered and used in our plan.

One keen observer, noting how completely we utilized the life forces, defined woodcraft as "Lifecraft." Another, struck by its practicability everywhere, said it was "Where you are, with what you have, right now." Another said it was "fun for male and female, old and young, with these three underlying rules:

"First, your fun must not be bought with money. Make your fun; woodcraft shows you how.

"Second, your fun must be enjoyed with due decorum. No one must be hurt in body, spirit or pocketbook.

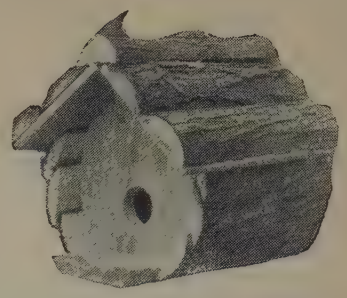
"Third, the best fun is that which appeals to the imagination. Physical fun has its place, but its zest is apt to pass with one's youth; joy in the realm of the imagination grows with one's years, and increases with each indulgence in it. At the end of a long life, it means more than at the beginning."

Now that I have laid such emphasis on recreation, let me justify the same by referring to some well-known facts.

According to many authorities, half our boys go wrong, make a failure of life, are more or less of a burden on society, and in a large and unnecessary proportion, become criminals. Some sociologists have put the number higher than half, some lower. But whatever it may be, there is a vast, deplorable wastage.

Why? Are 50 per cent of the boys born bad? Certainly not! Modern science tells us that about 1 in 2000 is born bad—that is, a pervert, a moron, one destined to be a nuisance, a pathological case that needs hospital treatment really—not jail.

How, then, is it that we have 50 per cent going bad? The answer is simple: wrong methods of upbringing, and especially, wrong methods of amusement.



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Jack-in-the-Pulpit

(Continued from page 282)

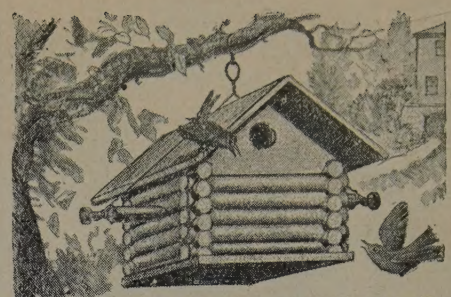
this is decidedly contrary to my experience. It cost me a very sore mouth once to discover that the statement is not always true.

Jack-in-the-pulpit grows over a wide territory, since it may be found from Nova Scotia to Florida and westward to Minnesota and Louisiana. The species is rather particular as to where it grows and is found growing most abundantly in rich, moist woods, although occasionally it thrives in the shade of thickets bordering woods. Ordinarily but two leaves are formed, both towering over the shorter-stemmed Jack, and each leaf is three-parted, a characteristic that is responsible for the specific part of the technical name, *Arisaema triphyllum*. The flowers usually appear during April and May, and the female "Jack" is replaced by a dense cluster of green berries during June and July. The rich green turns to a brilliant red or scarlet during August, and the handsome berry clusters remain for sometime after the leaves have withered and disappeared.

While discussing Jack-in-the-pulpit we must not neglect his novel first cousin, the green dragon or dragon-root, a plant with a spathe and spadix similar in form to Jack's but greenish or whitish in color and without the beautiful stripes that lend so much to Jack's beauty. The green dragon is found along streams and in moist woods, its range practically overlapping that of Jack-in-the-pulpit. Unlike in the Jack, the spadix is long and slender, sometimes extending several inches beyond the green spathe. The fruits or berries are reddish-orange in color, and each plant boasts of but a single leaf-stalk upon which from seven to eleven pointed leaflets may be found. And like its more handsome relative, the green dragon is in danger of extinction in many sections where it is hunted as one of nature's curiosities.

Owls and Indians

"Owls were too well understood by our native redmen to be regarded with much superstition, and the smaller ones were well liked," says Ernest Ingersoll in his book, "Birds in Legend, Fable and Folklore," published by Longmans. "Prince Maximilian mentions in his Travels (about 1836) that owls were kept in the lodges of the mandans and minnitarees, who lived in permanent villages in the upper Missouri Valley, and were regarded as 'soothsayers,' but I think they were no more than pets, as they are now in Zuni houses. Yet in the American Museum of Natural History in New York is a stuffed owl mounted on a stick, labeled as an object 'worshipped' by the sorcerers among the Menominee Indians (eastern Wisconsin), 'who believe they can assume the shape of an owl, and can in this disguise attack and kill their



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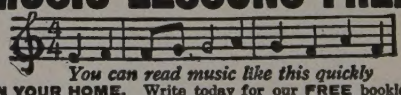

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enemies'—that is, they try to make others believe so. The owl is chosen for their disguise, of course, because it typifies the sly, unseen method of attack in darkness with which they sought to terrify the people."

The Smallest Bird's Egg

"The smallest bird's egg is that of the humming-bird, the largest is that of the extinct Aepyornis, which held six times as much as the ostrich's, and a hundred and fifty times as much as a fowl's," says Prof. J. Arthur Thomson in his "Biology of Birds," published by Macmillan. "It is said that the egg of the extinct Moa sometimes measured nine inches in breadth and twelve in length, but that of Aepyornis was far larger. Of European birds, the swan has the largest egg, the goldcrest the smallest. What is the biological significance of the difference in size?

"When a bird lays only one egg, it is likely to be relatively large, as in guillemot, gannet, and puffin, it may be noted that these birds lay in places where enemies are few and where it is not dangerous that the egg should have a conspicuous size. The eggs of the wingless kiwi of New Zealand are larger in proportion to the bird's size than in any other case; and it is interesting to notice that they (usually two) are stowed away in a nest at the end of a tunnel in the ground."

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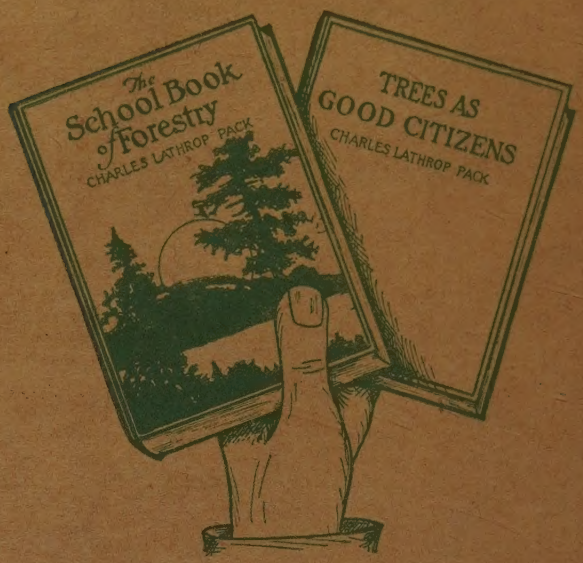

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